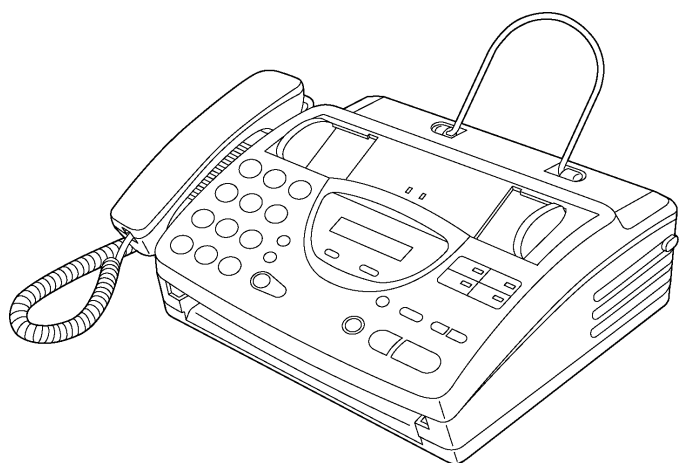# Service Manual

PARSONAL FACSIMILE

KX-FT21RS

(Russia)

⚠ WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public.
It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

When you note the serial number, write down all 11 digits. The serial number may be found on the bottom of the unit.

Panasonic

CONTENTS

1 INTRODUCTION

1.1. SAFETY PRECAUTIONS

1. Before servicing, unplug the AC power cord to prevent an electric shock.

2. When replacing parts, use only the manufacturer´s recommended components.

3. Check the condition of the power cord. Replace if wear or damage is evident.

4. After servicing, be sure to restore the lead dress, insulation barriers, insulation papers, shields, etc.

5. Before returning the serviced equipment to the customer, be sure to perform the following insulation resistance test to prevent the customer from being exposed to shock hazards.

1.2. INSULATION RESISTANCE TEST

1. Unplug the power cord and short the two prongs of the plug with a jumper wire.

2. Turn on the power switch.

3. Measure the resistance value with an ohmmeter between the jumpered AC plug and each exposed metal cabinet part (screw heads, control shafts, bottom frame, etc.).

   Note: Some exposed parts may be isolated from the chassis by design. These will read infinity.

4. If the measurement is outside the specified limits, there is a possibility of a shock hazard.
   The equipment should be repaired and rechecked before it is returned to the customer.

Exposed metal part

Ohmmeter

Resistance = more than 10M Ω
(at DC 500 V)
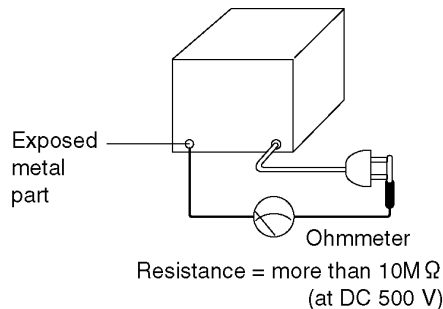
1.3. FOR SERVICE TECHNICIANS

ICs and LSIs are vulnerable to static electricity.
When repairing, the following precautions will help prevent recurring malfunctions.

1. Cover the plastic part´s boxes with aluminum foil.

2. Ground the soldering irons.

3. Use a conductive mat on the worktable.

4. Do not touch the IC or LSI pins with bare fingers.

1.4. BATTERY CAUTION

CAUTION

Danger of explosion if battery is incorrectly replaced.

Replace only with the same or equivalent type recommended by the manufacture. Dispose of used batteries according to the manufacturer´s instructions.

1.5. AC CAUTION

For safety, before closing the lower cabinet, please make sure of the following precautions.

(1) The earth lead is fixed with the screw.
(2) The AC connector is connected properly.
(3) Wrap the AC lead around the core 4 times.
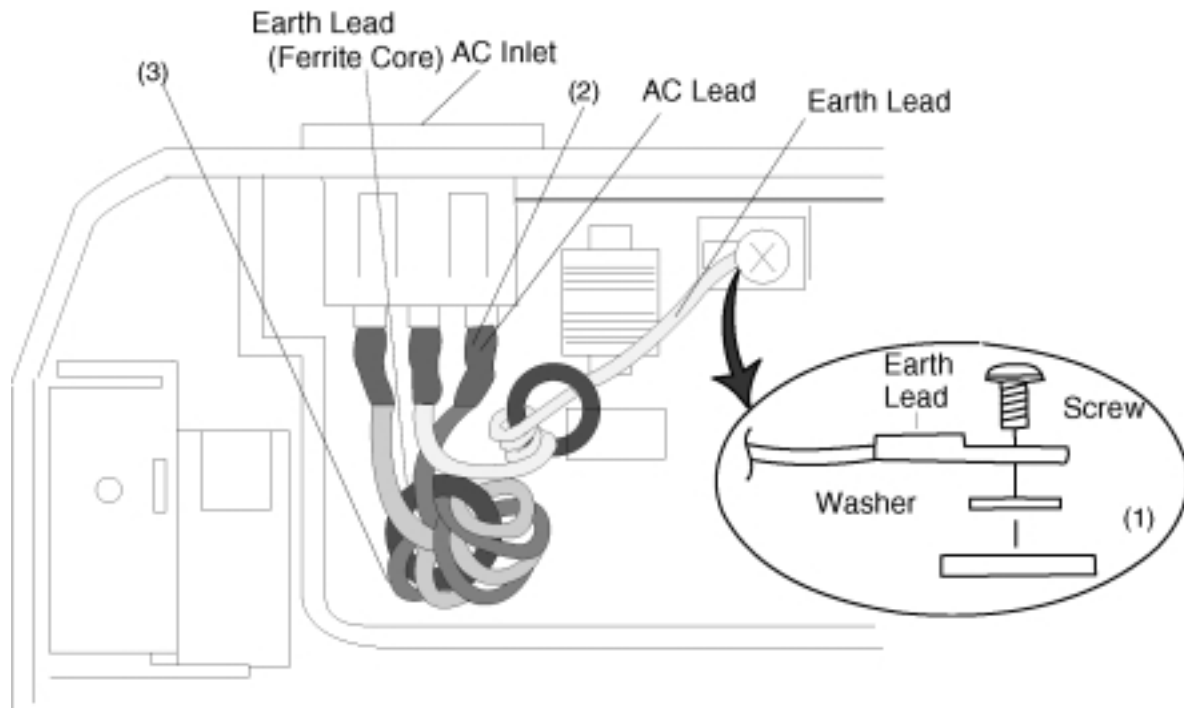
1.6.   PERSONAL SAFETY PRECAUTIONS

1.6.1.   MOVING SECTIONS OF THE UNIT

Be careful not to let your hair, clothes, fingers, accessories, etc., become caught in any moving sections of the unit.
The moving sections of the unit are the rollers and a gear. There is a separation roller and a document feed roller which are rotated by the document feed motor. A gear rotates the two rollers. Be careful not to touch them with your hands, especially when the unit is operating.
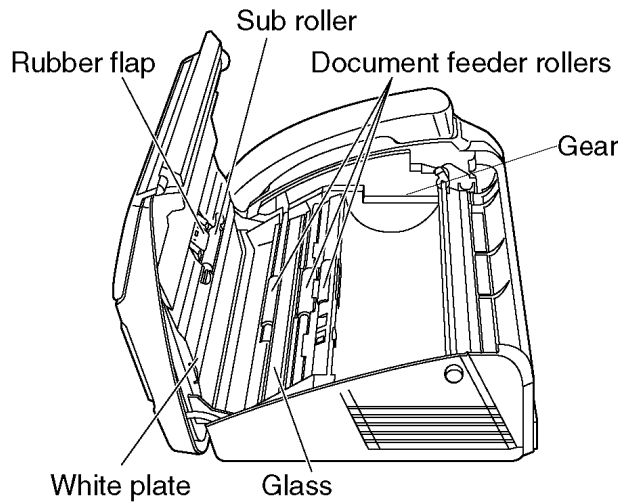
1.6.2.   LIVE ELECTRICAL SECTIONS

All the electrical sections of the unit supplied with AC power by the AC power cord are live.
 Never disassemble the unit for service with the AC power supply plugged in.

AC voltage is supplied to the primary side of the power supply unit.
Therefore, always unplug the AC power cord before disassembling for service.

Be careful of "High Voltage" in this area.
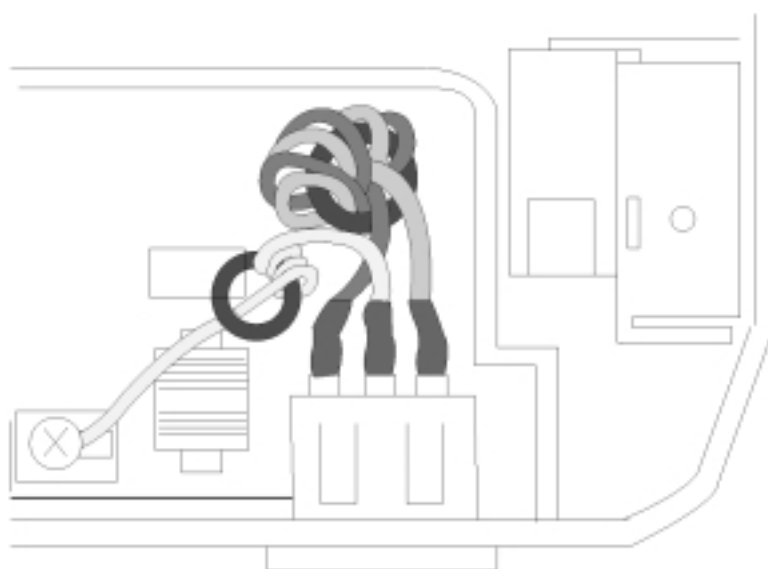
(Bottom View)
(Bottom view)

1.7.   FEATURES

General

- ・Desktop type
- ・LCD (Liquid Crystal Display) readout
- ・Help function
- ・Copier function

Facsimile

- ・Space Saving Compact Design
- ・Resolution: standard/fine/super fine/halftone
- ・Copier Function
- ・Automatic Document Feeder (10 Sheets)
- ・Help Printout
- ・Easy-to-view LCD (15 Characters)

Integrated telephone system

- ・Electric Volume Control
- ・On-hook dialing
- ・Redialing function
- ・Temporary tone dialing
- ・Electric telephone directory

1.8. SPECIFICATIONS

Applicable Lines:	Public Switched Telephone Network
Document Size:	Max. 216 mm (8 1/2") in width
	Max. 600 mm (23 5/8") in length
Effective Scanning Width:	208mm (8 3/16")
Recording Paper Size:	216 mm max. 30 m (8 1/2"×98") roll
Effective Printing Width:	208 mm (8 3/16")
Transmission Time*:	Approx. 15 s/page (Original mode)**
	Approx. 30 s/page (G3 Normal mode)
Scanning Density:	Horizontal:
	8 pels/mm (203 pels/inch)
	Vertical:
	3.85 lines/mm (98 lines/inch)—STANDARD mode
	7.7 lines/mm (196 lines/inch)—FINE/HALF TONE mode
	15.4 lines/mm (392 lines/inch)—SUPER FINE mode
Halftone Level:	64-level
Scanner Type:	Contact Image Sensor (CIS)
Printer Type:	Thermal Printing
Data Compression System:	Modified Huffman (MH), Modified READ (MR)
Modem Speed:	9,600 / 7,200 / 4,800 / 2,400 bps; Automatic Fallback
Operating Environment:	5°C—35°C (41°F—95°F), 45 %—85 % RH (Relative Humidity)
Dimensions (H×W×D):	122 mm × 338 mm × 240 mm (4 13/16" × 13 5/16" × 9 7/16")
Mass (Weight):	Approx. 2.5 kg (5.5 lb.)
Power Consumption:	Standby: Approx. 5.5 W
	Transmission: Approx. 17 W
	Reception: Approx. 30 W (When receiving the CCITT No. 1 Test Chart)
	Copy: Approx. 30 W (When copying the CCITT No. 1 Test Chart)
	Maximum: Approx. 120 W (When copying a 100 % black document)
Power Supply:	220—240 V AC, 50/60 Hz

* Transmission speed depends upon the contents of the pages, resolution, telephone line conditions and capability of the other party´s machine.

** The 15 second speed is based upon the CCITT No. 1 Test Chart.

Note:

· Any details given in these instructions are subject to change without notice.

· The pictures and illustrations in these instructions may vary slightly from the actual product.

1.9. OPTIONAL ACCESSORIES

Parts No.	Description	Comment
KX-A106	Standard thermal recording paper	216 mm × 30 m (8 1/2" × 98') roll, with 25 mm (1") core

THE SLEREXE COMPANY LIMITED

SAPORS LANE - BOOLE - DORSET - BH 25 8 ER

TELEPHONE BOOLE (945 13) 51617 - TELEX 123456

Our Ref. 350/PJC/EAC   18th January, 1972.

Dr. P.N. Cundall,
Mining Surveys Ltd.,
Holroyd Road,
Reading,
Berks.

Dear Pete,

Permit me to introduce you to the facility of facsimile
transmission.

In facsimile a photocell is caused to perform a raster scan over
the subject copy. The variations of print density on the document
cause the photocell to generate an analogous electrical video signal.
This signal is used to modulate a carrier, which is transmitted to a
remote destination over a radio or cable communications link.

At the remote terminal, demodulation reconstructs the video
signal, which is used to modulate the density of print produced by a
printing device. This device is scanning in a raster scan synchronised
with that at the transmitting terminal. As a result, a facsimile
copy of the subject document is produced.

Probably you have uses for this facility in your organisation.

Yours sincerely,

Phil.

P.J. CROSS
Group Leader - Facsimile Research

1.11. LOCATION OF CONTROLS

1.11.1. OVERVIEW

Document entrance

Document stacker

Document guide(s)

Cover open button

Document exit

1.11.2. CONTROL PANEL

• To change the receive mode

• To select a resolution

• For the Speed Dial
• For the Telephone Directory with Alpha-Search

Display panel
• The arrow indicator on the display points to your selected mode

• For the One-Touch Dial
• Command keys

Dial keypad

• Hookswitch

Panasonic

• To insert a hyphen

TEL

• To keep the telephone number secret

FAX

• To insert one character or one space

RESOLUTION   RECEIVE MODE

• To select stations 4–6 for the One-Touch Dial

FLASH

HELP   DIRECTORY   VOLUME SEARCH

REDIAL/PAUSE

• To adjust volumes
• To select feature settings during programming.
• To search for a stored name

TONE

MONITOR

MENU   STOP   START/COPY/SET

LOWER

• To change from pulse to tone during dialing

• To dial without lifting the handset.

• To stop an operation or cancel programming

• To initiate fax transmission, reception or copying.
• To store a setting during programming.

• To redial the last number dialed
• To insert a pause during dialing

• To print a quick reference

• To initiate or exit programming.

1.12. CONNECTIONS

Power cord

To the power
outlet (220 - 240V)

Connect to "LINE".

Handset cord

Telephone
line cord

To the single
telephone line

NOTE

When you operate this products, the power outlet should be near the product and easily accessible.

1.13. INSTALLATION

1.13.1. INSTALLING THE RECORDING PAPER

1 Open the cover by pressing the cover open button and install the recording paper roll.

correct   incorrect
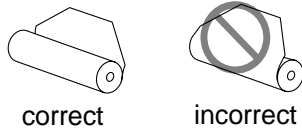
If the paper is secured with glue or tape, cut approximately 15 cm (6 inches) from the beginning.

Cover open button

2 Pull the leading edge of the paper approximately 10 cm (4 inches) out of the unit.
Make sure that there is no slack in the paper roll.

10 cm
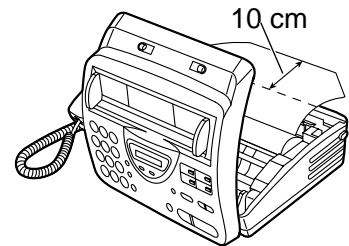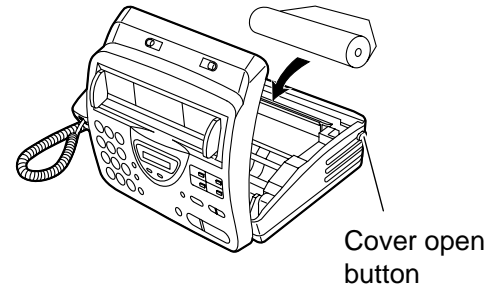
3 Close the cover securely by pushing down on both ends.
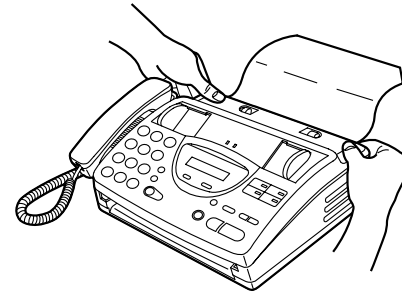
4 Tear off the excess paper by pulling it towards you.
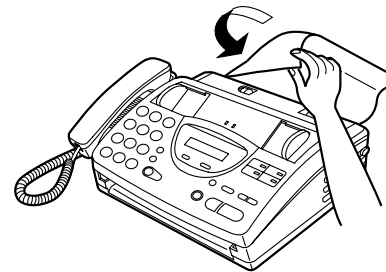
Note:

Only use the included roll of paper or specified recording paper, or else the print quality may be affected and/or excessive thermal head wear may occur.
For accessory order information.
When the power cord is connected, every time you close the cover a message will be printed. If the recording paper is set to the wrong side, the message will not be printed. Install the paper correctly.

1.13.2. Document Stacker

Install the document stacker.

Document stacker
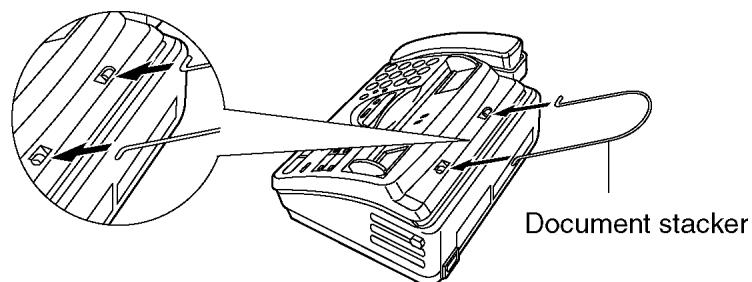
1.13.3.   SETTING YOUR LOGO

The logo can be your company, division or name.

1   Press (**MENU**) .

Display: | SYSTEM SET UP |

2   Press (**#**)**, then** (**0**)(**2**) .

| YOUR LOGO |

3   Press (**START/COPY/SET**) .

| LOGO= |

4   Enter your logo, up to 30 characters, by using
the dial keypad. See the next page for details.
Example: Bill

1. Press (**2**) twice.

| LOGO=B |

          └─Cursor

2. Press (**4**) six times.

| LOGO=Bi |

3. Press (**5**) six times.

| LOGO=Bil |

4. Press (►) to move the cursor to the next

space and press (**5**) six times.

| LOGO=Bill |

To enter the same number key continuously,
move the cursor to the next space.

5   Press (**START/COPY/SET**) .

| SETUP ITEM [   ] |

6   Press (**MENU**) .
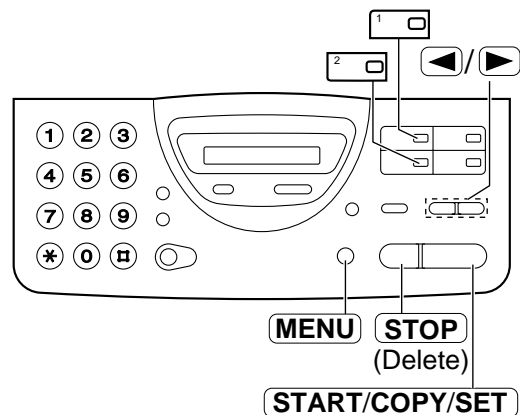
To correct a mistake

Press (◄) or (►) to move the cursor to the incorrect
character, then make the correction.

To delete a character

Move the cursor to the character you want to delete and
press (**STOP**) .

To insert a character

1. Press (◄) or (►) to move the cursor to the
   position to the right of where you want to
   insert the character.
2. Press [2 ▭] (One-Touch Dial key 2) to insert a
   space and enter the character.

**Note: Words in blankets ( ) are Spanish. A translated version for each market is available with this
model series.**

1.13.4. To select characters with the dial keypad

Pressing the dial keys will select a character as shown below.

Keys	Characters
(1)	1 [ ] { } + – / = , . _ ' : ; ? |
(2)	A B C a b c 2
(3)	D E F d e f 3
(4)	G H I g h i 4
(5)	J K L j k l 5
(6)	M N O m n o 6
(7)	P Q R S p q r s 7
(8)	T U V t u v 8
(9)	W X Y Z w x y z 9
(0)	0 ( ) < > ! " # $ % & ¥ ✳ @ ^ ' →
[¹ ▭]	**HYPHEN** key (Used to insert a hyphen.)
[² ▭]	**INSERT** key (Used to insert one character or one space.)
[STOP]	**Delete** key (Used to delete a character.)
◀	◀ key (Used to move the cursor to the left.)
▶	▶ key (Used to move the cursor to the right.) To enter another character using the same number key, move the cursor to the next space.

1.13.5. Documents you can send

Minimum size

128 mm (5")
128 mm (5")

Maximum size

600 mm (23⁵/₈")
216 mm (8¹/₂")

Effective scanning area

Scanned area

4 mm

208 mm (8³/₁₆")

Paper width
216 mm (8¹/₂")
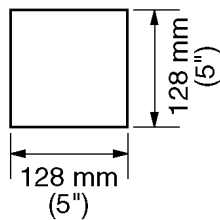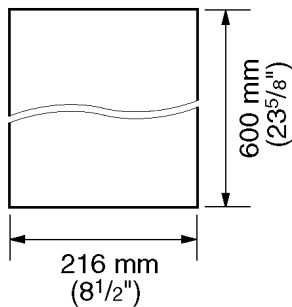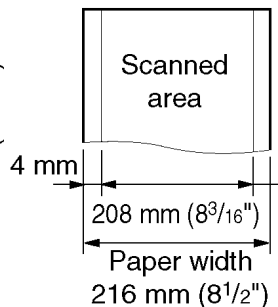
Document weight

Single sheet:
45 g/m² to 90 g/m²
(12 lb. to 24 lb.)

Multiple sheets (up to 10 sheets):
60 g/m² to 75 g/m²
(16 lb. to 20 lb.)

Note:

Remove clips, staples or other similar fastening objects.

Check that ink, paste or correction fluid has dried.

Do not send the following types of documents. Use copies for fax transmission.

· Chemically treated paper such as carbon or carbonless duplicating paper

· Electrostatically charged paper

· Heavily curled, creased or torn paper

· Paper with a coated surface

· Paper with a faint image

· Paper with printing on the opposite side that can be seen through the front (e.g. newspaper)

1.14. MAINTENANCE ITEMS AND COMPONENT LOCATIONS

1.14.1. OUTLINE

MAINTENANCE AND REPAIRS ARE PERFORMED USING THE FOLLOWING STEPS.

1. **Periodic maintenance**

   Inspect the equipment periodically and if necessary, clean any contaminated parts.

2. **Check for breakdowns**

   Look for problems and consider how they arose.
   If the equipment can be still used, perform copying, self testing or communication testing.

3. **Check equipment**

   Perform copying, self testing and communication testing to determine if the problem originates from the transmitter, receiver or the telephone line.

4. **Determine causes**

   Determine the causes of equipment problem by troubleshooting.

5. **Equipment repairs**

   Repair or replace the defective parts and take appropriate measures at this stage to ensure that the problem will not recur.

6. **Confirm normal operation of the equipment**

   After completing the repairs, conduct copying, self testing and communication testing to confirm that the equipment operates normally.

7. **Record keeping**

   Make a record of the measures taken to rectify the problem for future reference.

1.14.2. MAINTENANCE CHECK ITEMS/COMPONENT LOCATIONS

14
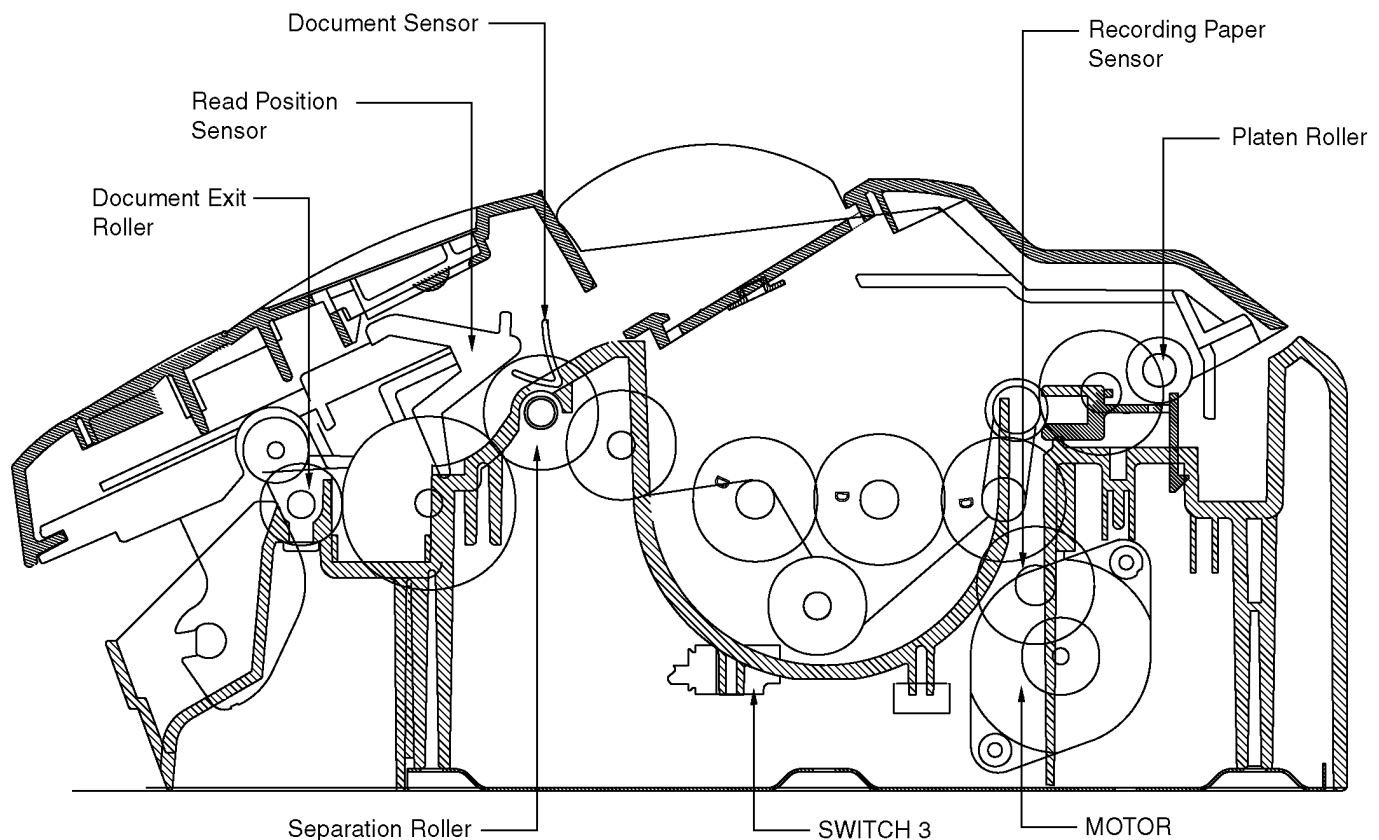
1.14.2.1. MAINTENANCE LIST

No.	OPERATION	CHECK	REMARKS
1	Document Path	Remove any foreign matter such as paper.	————
2	Rollers	If the roller is dirty, clean it with a damp cloth then dry thoroughly.	See **1.14.3. MAINTENANCE**.
3	Thermal Head	If the thermal head is dirty, clean the printing surface with a cloth moistened with denatured alcohol (alcohol without water), then dry thoroughly.	See **1.14.3. MAINTENANCE** and **4 DISASSEMBLYY INSTARUCTIONS**.
4	Glass	If the glass is dirty, clean the glass with a dry soft cloth.	See **1.14.3. MAINTENANCE**.
5	Sensors	Document sensor (PS1), Read position sensor (PS2), Recording paper/cover open sensor (SW1).	See **2.3.4.7. SENSOR SECTION**.
6	Abnormal, wear and tear or loose parts	Exchange the part. Check if the screws are tight on all parts.	————

1.14.2.2. MAINTENANCE CYCLE

No.	Item	Cleaning		Replacement	
		Cycle	Procedure	Cycle	Procedure
1	Separation Roller (Ref. No. 89)	3 months	See **1.14.3. MAINTENANCE**.	7 years (100,000 documents)	See **4 DISASSEMBLY INSTARUCTIONS**.
2	Separation Rubber (Ref. No. 85)	3 months	See **1.14.3. MAINTENANCE**.	7 years (100,000 documents)	See **4 DISASSEMBLY INSTARUCTIONS**.
3	Feed Rollers (Ref. No. 65)	3 months	See **1.14.3. MAINTENANCE**.	7 years (100,000 documents)	See **4 DISASSEMBLY INSTARUCTIONS**.
4	Thermal Head (Ref. No. 55)	3 months	See **1.14.3. MAINTENANCE**.	7 years (100,000 documents)	See **4 DISASSEMBLY INSTARUCTIONS**.

These values are only standard ones and may vary depending on usage conditions.

1.14.3.   MAINTENANCE

1.14.3.1.   CLEANING THE DOCUMENT FEEDER UNIT

If misfeeding occurs frequently or if dirty patterns or black bands appear on a copied or transmitted document, clean the document feeder.

1   **Disconnect the power cord and the telephone line cord.**

2   Open the cover by pressing the cover open button.

3   Clean the document feeder rollers, sub roller and rubber flap with a cloth moistened with isopropyl rubbing alcohol, and let all parts dry thoroughly.

4   Clean the white plate and glass with a soft dry cloth.

5   Close the cover securely by pushing down on both ends.

6   Connect the power cord and the telephone line cord.

Caution:
   Do not use paper products, such as paper towels or tissues, to clean the inside of the unit.

Telephone line code

Power cord

Separation roller
Sub roller
Cover
Document feeder rollers
Cover open button
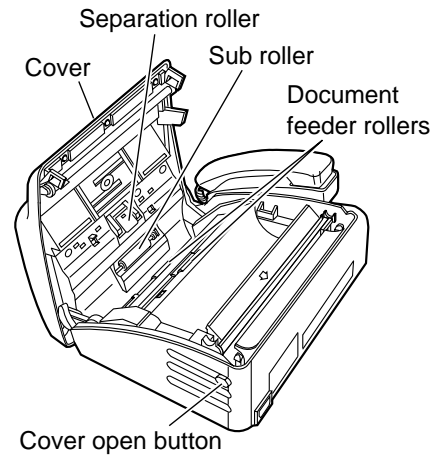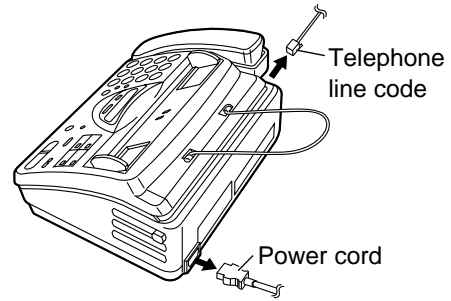
1.14.3.2. CLEANING THE THERMAL HEAD

If dirty patterns or black bands appear on a copied or received document, clean the thermal head.

1 **Disconnect the power cord and the telephone line cord.**

2 Open the cover by pressing the cover open button.

3 Clean the thermal head with a cloth moistened with isopropyl rubbing alcohol, and let it dry thoroughly.

4 Close the cover securely by pushing down on both ends.

5 Connect the power cord and the telephone line cord.

Thermal head

Cover open button

**Caution:
Do not push on
the black cover**

Caution:

  To prevent a malfunction due to static electricity, do not use a dry cloth and do not touch the thermal head directly with your fingers.

1.14.3.3. CLEANING THE PICK UP ROLLER........Refer to 4 DISASSEMBLY INSTRUCTION

2 TROUBLESHOOTING GUIDE

2.1. TROUBLESHOOTING SUMMARY

2.1.1. TROUBLESHOOTING

After confirming the problem by asking the user, troubleshoot according to the instructions and observe the following precautions.

2.1.2. PRECAUTIONS

1. If there is a problem with the print quality or the paper feed, first check if the installation space and the print paper meets the specifications, the paper selection lever/paper thickness lever is set correctly, and the paper is set correctly without any slack.

2. Before troubleshooting, first check that the connectors and cables are connected correctly (not loose).

   If the problem occurs randomly, check it very carefully.

3. When connecting the AC power cord with the unit case and checking the operation, exercise utmost care when handling electric parts in order to avoid electric shocks and short-circuits.

4. After troubleshooting, double check that you have not forgotten any connectors, left any loose screws, etc.

5. Always test to verify that the unit is working normally.

2.1.3. WHEN YOU DON´T KNOW HOW TO OPERATE THE UNIT, USE THE HELP FUNCTION

- How to use: 1. Press (HELP).
  2. Press (▲) or (▼) until the desired item is displayed.
  3. Press (START/COPY/SET).

2.2. USER RECOVERABLE ERRORS

If the unit detects a problem, the following messages will appear on the display.

Display Message	Cause & Remedy
CALL SERVICE 1	There is something wrong with the unit. Contact our service personnel. [This error is displayed when the thermal head dose not warm up. Check the thermistor on the thermal head and connector lead. (for technicians)]
CALL SERVICE 2	This message appears when the gear is not in an idle state. Check the GEAR BLOCK.
CHECK COVER	The cover is open. Close it.
CHECK DOCUMENT	The document is not fed into the unit properly. Reinsert the document. If misfeeding occurs frequently, clean the document feeder rollers and try again. If the problem remains, adjust the feeder pressure. Attempted to transmit a document longer than 600 mm. Press the STOP button to remove the document. Divide the document into two or more sheets and try again.
CHECK MEMORY	Memory (telephone numbers, parameters, etc.) has been erased. Re-program. [The backup battery on the top of the digital board may be low or dead, so check it.]
NO RESPONSE	The other party's fax machine is busy or ran out of recording paper. Try again.
OUT OF PAPER	The unit runs out of recording paper. Install a recording paper.
POLLING ERROR	The other party's fax machine does not have a polling feature. Check with the other party.
REDIAL TIME OUT	The other party's fax machine is busy or ran out of recording paper. Try again.
REMOVE DOCUMENT	The document is jammed. Remove the jammed document. [Alternately, turn off service code #559 to enable sending of documents longer than 600 mm.]
TRANSMIT ERROR	A transmission error occurred. Try again.
UNIT OVERHEATED	The unit is too hot. Let the unit cool down. [If many copies are nearly all black, this message will be displayed. When this occurs, open the front cover and let the unit cool down.]

✳ The explanations given in the [ ] are for serviceman only.

Note:

The explanations given in the [ ] are for servicemen only.

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2.2.1. Document Jam

If the unit does not release the document during feeding, remove the jammed document as follows.

1 Open the cover by pressing the cover open button.

2 Remove the jammed document carefully.

3 Close the cover securely by pushing down on both ends.

Note:
• Do not pull out the jammed paper forcibly. before opening the cover.

Cover open button
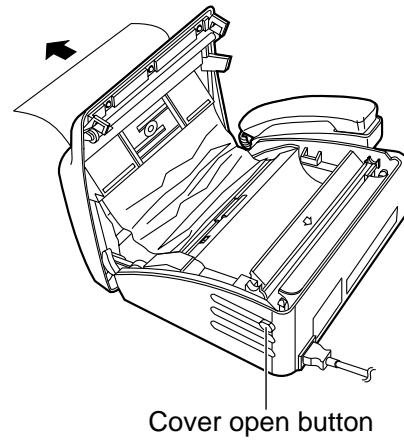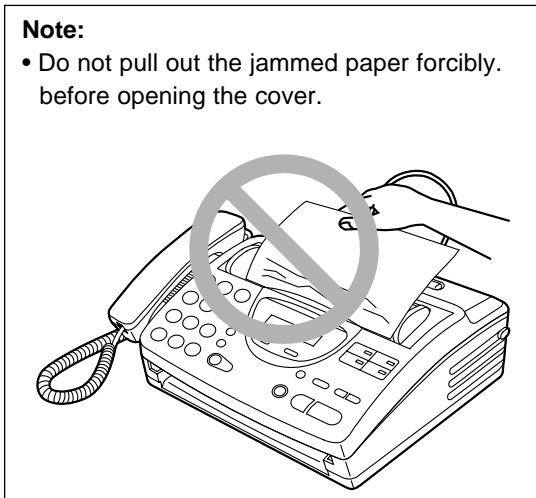
2.3.   TROUBLESHOOTING DETAILS

2.3.1.   OUTLINE

Troubleshooting guide provides a logical path of deduction to assist in locating a fault and suggests methods of restoring the unit to full working condition. Use the reported symptoms of the fault to determine the best troubleshooting method. Even difficult faults can be tracked to a specific block or area, for example, the "Digital Board" or "Image Sensor".

A variety of fault descriptions from customers often point to the same area and, for this reason, careful analysis of the reported symptoms is required. After every repair, test all functions to ensure no problems are evident.

2.3.2.   STARTING TROUBLESHOOTING

Select the appropriate troubleshooting method according to the symptoms.
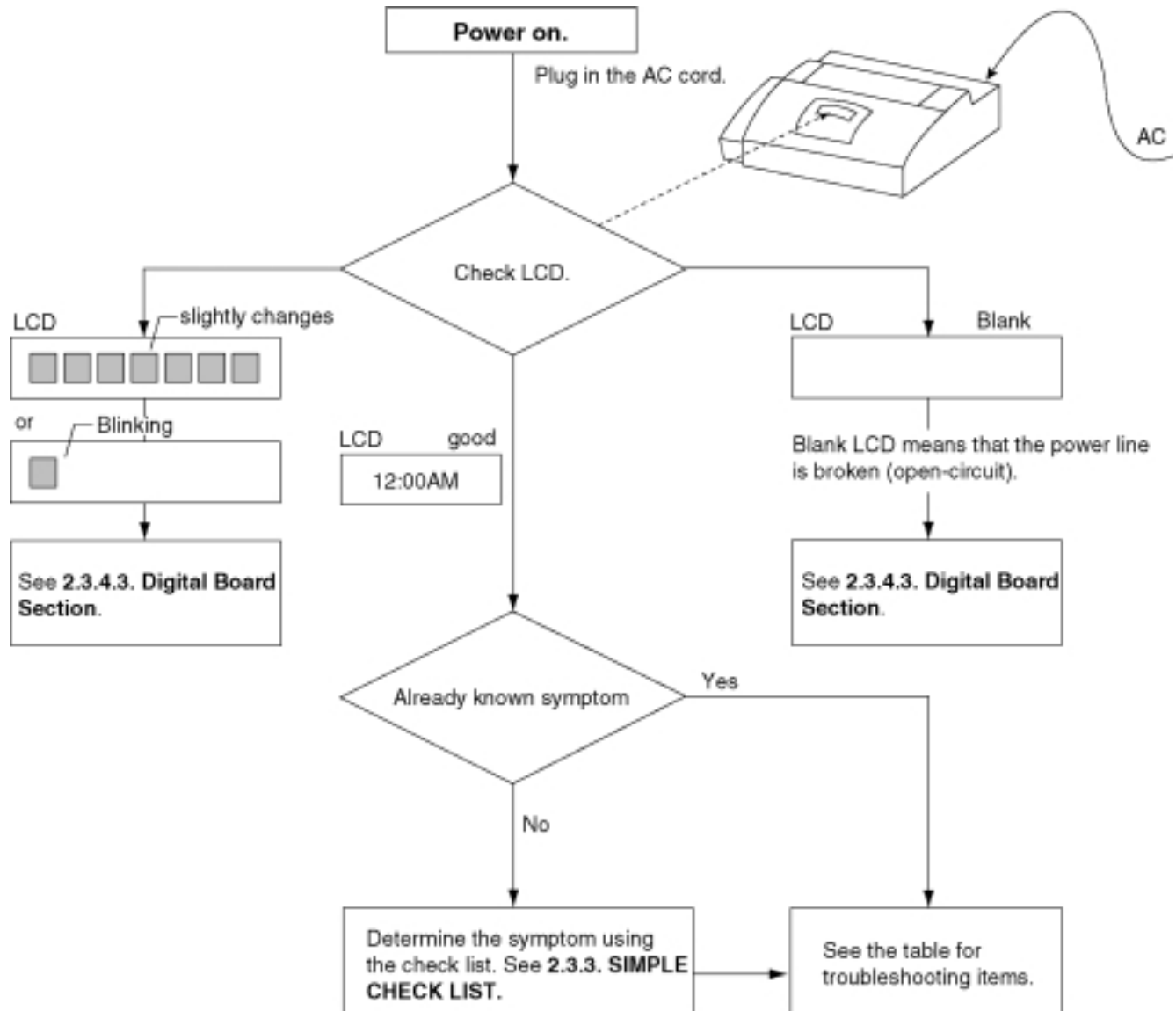
2.3.3. Simple Check List

FUNCTION		JUDGEMENT	REFERENCE
FAX operation	Transmission	OK / NG	
	Receiving	OK / NG	
Copy operation	FINE mode	OK / NG	
	HALF TONE mode	OK / NG	
Telephone operation	Handset transceiver / receive	OK / NG	
	Monitor sound	OK / NG	
	Ringer sound	OK / NG	
	Dial operation	OK / NG	
	Volume operation	OK / NG	
Operation panel	Key check	OK / NG	SERVICE CODE 561
	LCD check	OK / NG	SERVICE CODE 558
Sensor	Sensor check	OK / NG	SERVICE CODE 815
Clock		OK / NG	Is the time kept correctly? Check with another clock.
External Telephone	Handset transceiver/receiver	OK / NG	
	Remote control	OK / NG	Change to FAX receiving by pressing ✽9. (Refer to user mode #41 to **2.3.4.2.2. Remote Programmig**.)

✽ Check according to the service code referring to **2.5. TEST FUNCTION**.

2.3.4.   TROUBLESHOOTING ITEMS TABLE

FUNCTION	SYMPTOM	SEE THIS PAGE.
Printing	Skewed receiving image Expanded print Image is distorted. Black or White vertical lines appear.	See **2.3.4.1. ADF (Auto document feed) SECTION**.
ADF (Auto Document Feeder)	No feed Paper jam Multiple feed Skew	See **2.3.4.1. ADF (Auto document feed) SECTION**.
Abnormal mechanical sound	Abnormal sound from the product	See **2.3.4.1. ADF (Auto document feed) SECTION**.
Power supply	Voltage output is abnormal.	See **2.3.4.5. Power Supply Board Section**.
Operation panel	Keys are not accepted.	See **2.3.4.6. Operation Board Section**.
Sensor	If the electric circuit is the cause, "REMOVE DOCUMENT" will be displayed.	See **2.3.4.7. Sensor Board Section**.
Communication FAX, TEL (Analog/Digital board)	Cannot communicate by fax. Error code is displayed. Cannot talk. DTMF tone doesn't work. Handset/Monitor sound, volume	See **2.3.4.2.1. Defective Facsimile Section**. The analog board may cause these symptoms. See **2.3.4.4. Analog Board Section**.

2.3.4.1. ADF (Auto Document Feed) Section

1. No document feed

When setting the document, confirm a beep tone.

* When using thin paper etc., if the document will not feed. Refer to **3.1. ADJUSTING THE FEED PRESSURE**.

OK? — NO → Check the separation spring for distortion. — OK → Check the sensor lever movement. — NG → Replace the sensor lever.

YES ↓

Clean the separation roller. Refer to **4 DISASSEMBLY INSTRUCTIONS**.

OK ↓ (from sensor lever movement)

Check the sensor [Use the sensor check function (Refer to **2.5. TEST FUNCTIONS**.)] and digital board. (Refer to **2.3.4.3. Digital Board Section** and **2.3.4.7. Sensor Section**) — NG → Replace the defective parts.

OK? — OK → END

NG ↓

Does the separation roller rotate? [Use the motor test function (Refer **2.5. TEST FUNCTION**.)] — NO → Check the motor and connector. → OK? — NG → Replace the motor and connector.

YES ↓   YES ↓

Adjust the separation spring and clean or replace the pad. — NO → OK? — OK → END

Check the gear.

NG ↓ (OK? NG)

YES ↓   OK? — NG → Replace the gear.

Replace the separation roller unit. — NO → OK? — OK → END   YES ↓

NG ↓

YES ↓

Replace the operating cover unit.

↓

Go to **2.3.4.3. Digital Board Section**. — → Is the phase signal from pins 149-154 of IC1 output? — YES → Is the voltage at emitter of Q7 +24 V? — NO → Check the power supply unit section. (Refer to **2.3.4.5. Power Supply Board Section**.)

NO ↓   YES ↓

Repair. ← NO — Is the solder at pins 149-154 of IC1 OK?

YES ↓   Is the voltage at collector of Q7 + 24 V? — YES → Replace IC7.

Replace IC7.   NO ↓   OK? — NO → Replace the motor.

                                                   Is the voltage at base of Q14 less than 2V? — NO →   YES ↓

                                                   YES ↓   END

                                                   Replace Q7, Q14. → OK?

                                                   NO ↓

YES ↓

END

2. Paper JAM

Open the lid and check the feed route.

Check the paper jam for cause.

OK? — NO → Clean or replace the defective parts. → OK? — OK → END

NG

YES

Clean each roller.
(Refer to **4 DISASSEMBLY INSTRUCTIONS**) → OK? — OK → END

NG

Check each sensor's movement.

Confirm if the tip of the read position sensor lever works smoothly.
[Use the sensor test function (Refer to **2.5. TEST FUNCTIONS**.).]

OK? — NO → Repair or replace the sensor lever. → OK? — OK → END

YES

NG

Go to **2.3.4.7. Sensor Section**.

Check if the sensor reacts while the flag is moving.

Check each roller's mount.

Check if the separation, feed and pinch rollers are attached correctly.

OK? — NO → Repair the defective parts. → OK? — OK → END

YES

NG

Check the white plate.

NG

Replace the white plate.

3. **Multiple feed**

When using thick paper etc., If the document will not feed.

Refer to **3.1. ADJUSTING THE FEED PRESSURE**.

Check the separation pad.　Confirm whether the pad is dirty or not and if it is attached correctly.

OK? — NO → Clean or replace the defective parts. — OK? — OK → END

YES   NG

Check if the separation spring is distorted. — OK? — OK → END

NG

Clean each roller. (Refer to **4 DISASSEMBLY INSTRUCTIONS.**) — OK? — OK → END

NG

Replace the separation pad, roller and pressure spring.

4. Skew

| Is the document set OK? | Check the document for folds or if tape or staples are attached. Also check whether a different size document is set at the same time. |

```
                                NO                                                    OK
        OK? ──────────────────────────►  Reset the document.  ─────────►    OK?  ──────────►  END
        YES                                                              NG
```

Check whether there are foreign objects or missing parts.

```
                                NO                                                    OK
        OK? ──────────────────────────►  Clean or replace the  ─────────►   OK?  ──────────►  END
        YES                              defective parts.              NG
```

Check the balance of both separation pressure springs.

```
                                NO                                                    OK
        OK? ──────────────────────────►  Replace the separation ─────────►  OK?  ──────────►  END
        YES                              pressure spring.            NG
```

Clean each roller. (Refer to **4 DISASSEMBLY INSTRUCTIONS**.)

```
                                          OK
                               OK?  ──────────►  END
                            NG
```

Check the white plate.

```
                                NO                                                    OK
        OK? ──────────────────────────►  Replace the white plate. ───────►  OK?  ──────────►  END
        YES                                                          NG
```

Check the CIS unit.

```
                                NO                                                    OK
        OK? ──────────────────────────►  Repair or replace the ─────────►   OK?  ──────────►  END
         │                               defective parts.
         ▼
        END
```

5. Image is distorted (When printing)

Please perform the print test
(Refer to **2.5. TEST FUNCTIONS**.).

OK? — NO → Go to **2.3.4.9. Thermal Head Section**.

YES

Check the feed route. Check if there are foreign objects or missing parts.

OK? — NO → Clean or repair the defective parts. → OK? — OK → END

YES NG

Clean each roller.
(Refer to **4 DISASSEMBLY INSTRUCTIONS**.) → Check for relapse. — OK → END

NG

Check the white plate. Confirm the plate is not damaged.

OK? — NO → Replace the white plate. → OK? — OK → END

YES NG

Check each roller. Check if the separation, feed and pinch rollers are attached correctly.

OK? — NO → Repair the defective parts. → OK? — OK → END

YES NG

Check each roller for dirt or scratches.

OK? — NO → Clean each roller.
(Refer to **4 DISASSEMBLY INSTRUCTIONS**.) → OK? — OK → END

YES NG

Go to **2.3.4.8. Read Section**. If image distortion is within -1.5%, this is considered normal.

6. **Black or white vertical lines appear**

```
        ┌─────────────────────┐
        │ Please perform the print │
        │ test (Refer to 2.5. TEST │
        │ FUNCTIONS.).             │
        └─────────────────────┘
                   │
                   ▼
            ◇ Do lines appear? ◇ ──YES──▶ ┌──────────────────────────┐
                   │                       │ Replace the thermal head. │
                   NO                      └──────────────────────────┘
                   │
        ┌─────────────────────┐     Clean the white plate and target glass thoroughly.
        │ Clean the feed route. │
        └─────────────────────┘
                   │
                   ▼
            ◇ Do lines appear? ◇ ──NO──▶ END
                   │
                   YES
                   │
        ┌─────────────────────┐
        │ Replace the white plate, │
        │ CIS unit, etc.           │
        └─────────────────────┘
                   │
                   ▼
               ◇ OK? ◇ ──OK──▶ END
                   │
                   NG
                   │
        ┌─────────────────────────┐
        │ Go to the read digital board │
        │ section. (Refer to 2.3.4.3. │
        │ Digital Board Section.)     │
        └─────────────────────────┘
```

7. **Skewed receiving image**

```
        ┌─────────────────────┐
        │ Check the recording │ ──NG──▶ ┌──────────────────────────┐
        │ paper setling.       │         │ Reset the recording paper. │
        └─────────────────────┘         └──────────────────────────┘
                   │
                   OK
                   │
        ┌─────────────────────┐
        │ Replace the         │
        │ recording paper roller. │
        └─────────────────────┘
```

8. Expander print (When printing)

```
┌─────────────────────────┐   NG    ┌─────────────────────────┐
│ Check if the cover open │────────▶│ Lock the cover open     │
│ button is locked.       │         │ button.                 │
└─────────────────────────┘         └─────────────────────────┘
           │ OK
           ▼
┌─────────────────────────┐
│ Clean each roller.      │
│ (Refer to 4             │
│ DISASSEMBLY             │
│ INSTRUCTIONS.)          │
└─────────────────────────┘
```

9. When copying or printing, an abnormal sound is heard from the unit

```
┌─────────────────────────┐ ADF section ┌─────────────────────────┐
│ In a print test, is the │────────────▶│ Check the document      │──▶ (A)
│ noise heard from the    │             │ conveyance element.     │  (Next page)
│ printing section or ADF │             └─────────────────────────┘
│ section?                │
└─────────────────────────┘
           │ Printing section
           ▼
┌─────────────────────────┐
│ Check the printing      │
│ section.                │
└─────────────────────────┘
           │
           ▼
┌─────────────────────────┐   Check the drive gear for damage, inserted foreign
│ Does the recording      │   objects and also if the pendulum gear spring is
│ paper convey ? Confirm  │   attached correctly.
│ the drive section.      │
└─────────────────────────┘
           │
           ▼
     ◇─────────────◇   NO    ┌─────────────────────────────────────────────┐
     │  Defective? │────────▶│ Check the other rotation sections,          │
     ◇─────────────◇         │ operations, oscillation sections and fix or │
           │ YES             │ change the defective part.                  │
           ▼                 └─────────────────────────────────────────────┘
┌─────────────────────────┐
│ Fix or change the       │
│ defective part.         │
└─────────────────────────┘
```

(From the previous page)

A

Confirm the document's conveyance drive section. | Check each roller (Refer to **4 DISASSEMBLY INSTRUCTIONS**.) for damage, inserted foreign objects or improper installation.

OK? —NO→ Fix, clean or change the defective part. → Does it recur? —NO→ END

YES

YES

Re-grease the spring. (Earth spring A) | Grease the motor and gear. (Do not apply large amounts of grease.)

Does it recur? —NO→ END

YES

Change the gear and gear chassis.

2.3.4.2. Communication Section

Find the problem in the table shown below, and refer to the corresponding troubleshooting procedure in **2.3.4.2.1. Defective facsimile section**.

No.	Symptom	Content	Possible cause
1	The paper does not feed properly when faxing. (Copying is also not possible.)	Troubleshooting	Problem with the feeding mechanism.
2	The fax transmits successfully one time and fails another. (Copying is possible.)	Troubleshooting	Problem with the service line or the receiver's fax.
3	The fax receives successfully one time and fails another. (Copying is possible.)	Troubleshooting	Problem with the service line or the transmitter's fax.
4	The fax completely fails to transmit or receive. (Copying is possible.)	Troubleshooting	Problem with an electric circuit.
5	The fax fails either to transmit or receive when making a long distance or international call. (Copying is possible.)	Detailed description of the possible causes (Similar to troubleshooting items No.2 and No.3.)	Problem with the service line.
6	No.1-No.5	Troubleshooting procedure for each error code printed on the communication result report.	

2.3.4.2.1. Defective facsimile section

1. Transmit problem

```
┌─────────────────────┐        "USER STOPPED" ◄──────── Message on LCD
│     TX Problem      │
└─────────────────────┘
```

Was the STOP key pressed?
- YES → No problem.
- NO → Operation panel section (**2.3.4.6. Operation Board Section**)

Paper jam?
- YES → ADF section (Refer to **2.3.4.1. ADF (Auto document feed) SECTION.**)
- NO ↓

The document only partially feeds.
- YES → Press down the READ SENSOR gently, and immediately release it.
- NO ↓

All of the document feeds, but the communication result is error.
- YES → Press down the READ SENSOR gently, and immediately release it.
- NO ↓

Press down the READ SENSOR gently, and immediately release it.
- OK → Clean the separation roller using a damp cloth. Try again. (Rubbing alcohol)
- NG → Check if the sensor is installed properly.

No pages are fed.
→ ADF section (Refer to **2.3.4.1. ADF (Auto document feed) SECTION.**)

Clean the separation roller using a damp cloth. Try again. (Rubbing alcohol)
- NG → Replace the separation roller.

Replace the separation roller.
→ END

Check if the sensor is installed properly.
↓
OK?
- YES → END
- NO → Sensor section page.

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2. Sometimes there is a transmit problem

TX Problem

Transmit Error ◄——— Message on LCD

Is the document pre-fed? — NO

YES

Is TX started ?
(Does it start feeding?) — NO

YES

The document goes through.

Is auto dial used? — YES

NO

Was the START key
pressed immediately
after dialing? — NO

YES

Ask the other party to
change the RX equalizer
& increase the TX level.

Change the "596:
Transmit level set"
from -10 dBm to
-15 dBm or some
value.

Check the other party's
machine. (Out of paper,
Auto answer off, etc.)

NG

OK

Confirm if the sent image
on the RX side has many
errors?

Change the "596: Transmit
level set" from -10 dBm
to -12 dBm or some value. — NG — Change the "596: Transmit
level set" from -10 dBm to
-15 dBm or some value.

Check the current TX level.

OK

Ask the RX party to increase
the RX error line value
parameter.

Change the "594: Overseas
DIS detection" to "Detect
at the 2nd time".

(Not available.)

Change the "717: Transmit
speed select " to
7200, 4800 or 2400 bps.

Confirm if "592: CNG TX
select" is set to "ALL".

Ask the other party to
increase the TX level.

3. **Reception problem**

Confirm the following before starting troubleshooting.
Is the recording paper installed properly?

There is the receiving problem when sometimes the below errors may be occurred.
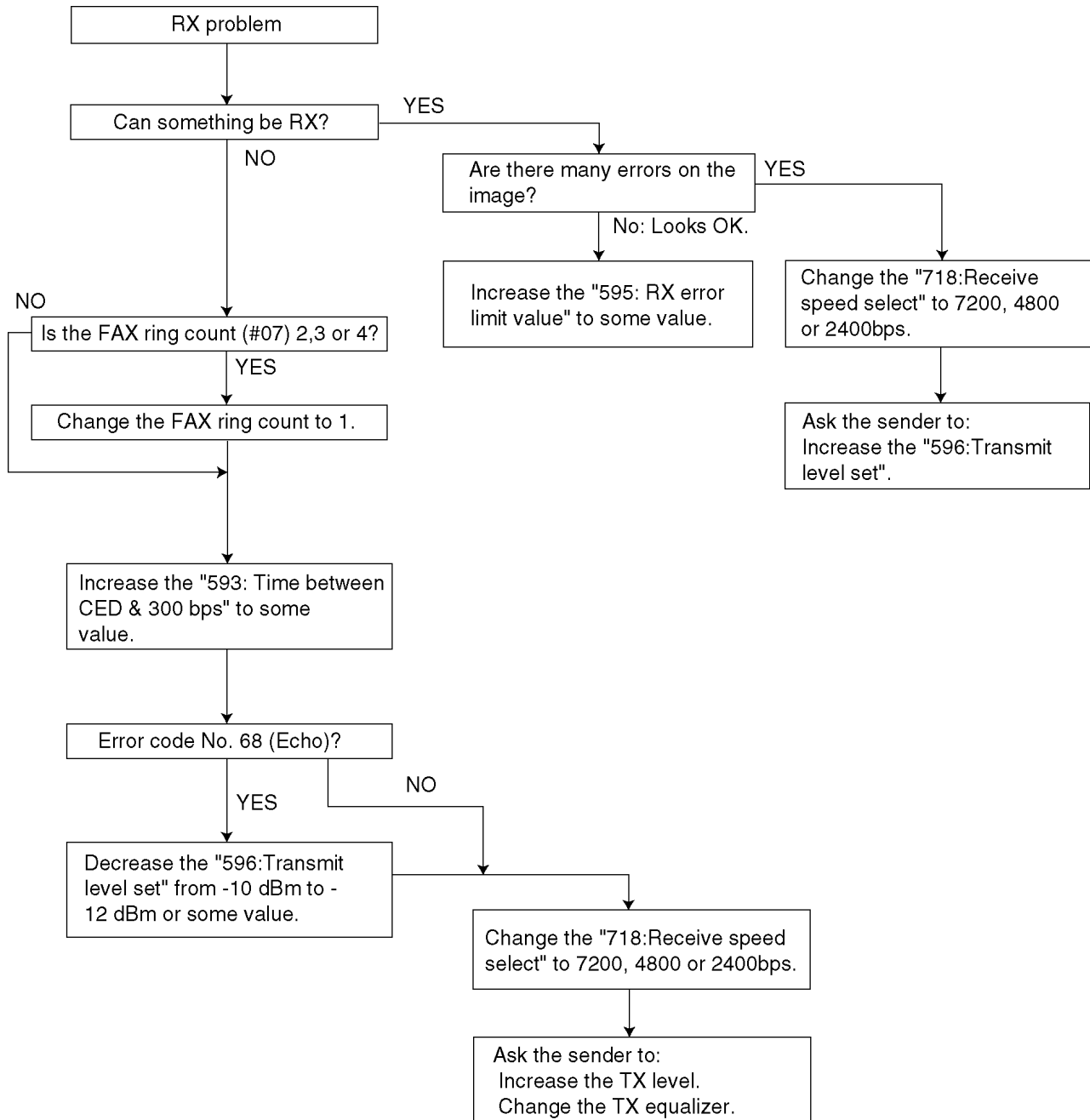
OUT OF PAPER
CHECK COVER
Unit OVERHEATED (If it doesn´t return automatically, COVER OPEN, etc., reset the unit.)
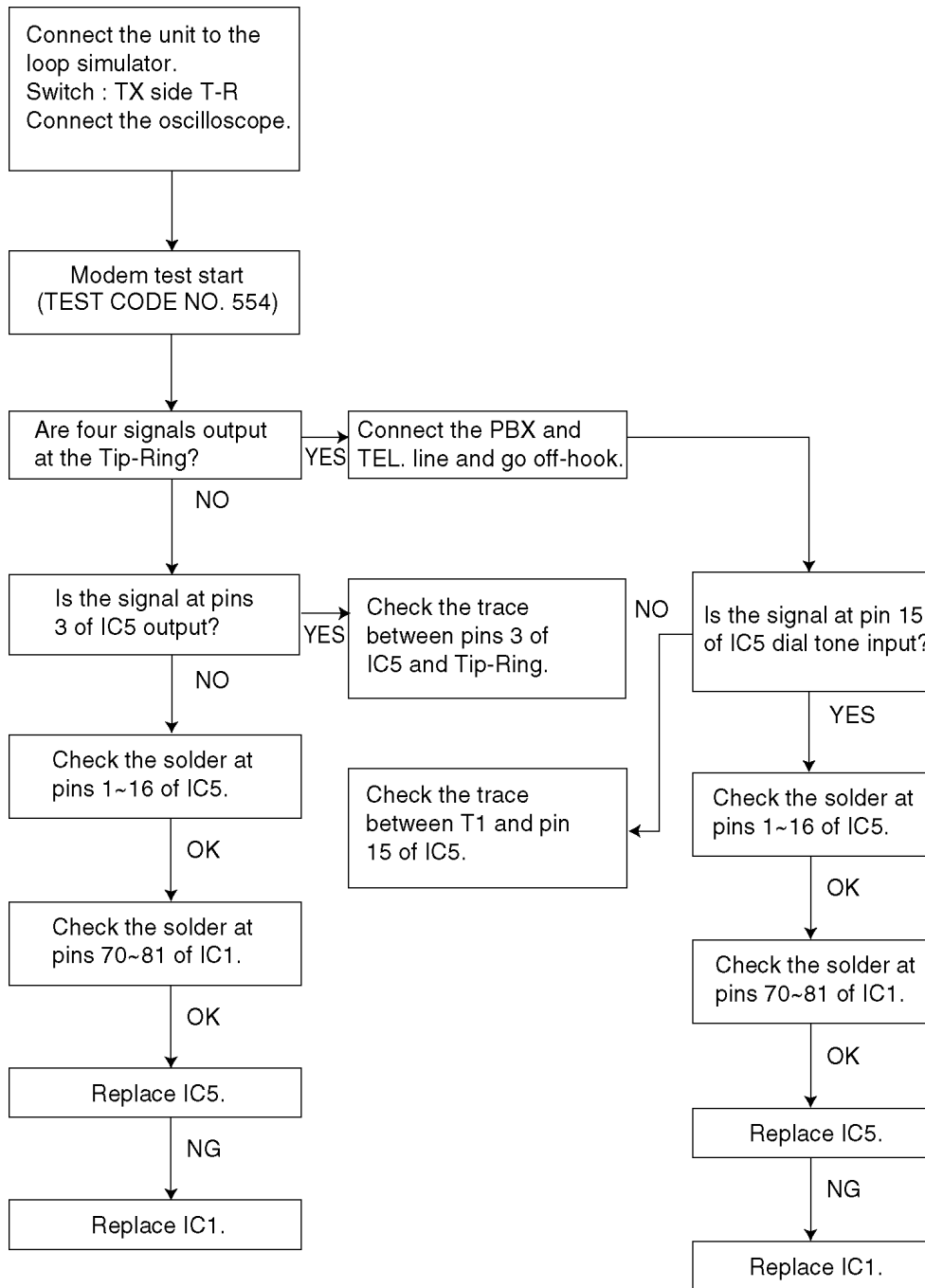CHECK DOCUMENT
PAPER JAM

Please refer to **2.2. User Recoverable Errors** for the above items.
Also, when a hardware deformity occurs, please check each sensor.

```
                    ┌────────────────────────┐
                    │      RX problem        │
                    └────────────────────────┘
                                │
                                ▼
         ┌──────────────────────────────┐   YES
         │   Can something be RX?        ├──────────────┐
         └──────────────────────────────┘              │
                       NO                               ▼
                                        ┌─────────────────────────────┐  YES
                                        │ Are there many errors on the ├──────────┐
                                        │ image?                       │          │
                                        └─────────────────────────────┘          │
                                                  No: Looks OK.                   │
                                                        ▼                         ▼
                                        ┌─────────────────────────┐  ┌─────────────────────────┐
                                        │ Increase the "595: RX   │  │ Change the "718:Receive │
                                        │ error limit value" to   │  │ speed select" to 7200,  │
                                        │ some value.             │  │ 4800 or 2400bps.        │
                                        └─────────────────────────┘  └─────────────────────────┘
                                                                                  │
                                                                                  ▼
    NO                                                            ┌─────────────────────────┐
  ┌──────────────────────────────────────┐                       │ Ask the sender to:      │
  │ Is the FAX ring count (#07) 2,3 or 4? │                       │ Increase the "596:      │
  └──────────────────────────────────────┘                       │ Transmit level set".    │
                       YES                                        └─────────────────────────┘
                        ▼
  ┌──────────────────────────────────────┐
  │ Change the FAX ring count to 1.       │
  └──────────────────────────────────────┘
                        │
                        ▼
  ┌──────────────────────────────────────┐
  │ Increase the "593: Time between       │
  │ CED & 300 bps" to some                │
  │ value.                                │
  └──────────────────────────────────────┘
                        │
                        ▼
  ┌──────────────────────────────────────┐
  │ Error code No. 68 (Echo)?             ├──── NO ────┐
  └──────────────────────────────────────┘            │
                       YES                             │
                        ▼                              ▼
  ┌──────────────────────────────────────┐  ┌─────────────────────────┐
  │ Decrease the "596:Transmit           │  │ Change the "718:Receive │
  │ level set" from -10 dBm to -          │  │ speed select" to 7200,  │
  │ 12 dBm or some value.                 │  │ 4800 or 2400bps.        │
  └──────────────────────────────────────┘  └─────────────────────────┘
                                                        │
                                                        ▼
                                            ┌─────────────────────────┐
                                            │ Ask the sender to:      │
                                            │ Increase the TX level.  │
                                            │ Change the TX equalizer.│
                                            └─────────────────────────┘
```

4. The unit can copy, but cannot transmit/receive

```
┌─────────────────────────┐
│ Connect the unit to the │
│ loop simulator.         │
│ Switch : TX side T-R    │
│ Connect the oscilloscope.│
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│ Modem test start        │
│ (TEST CODE NO. 554)     │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐  YES  ┌─────────────────────────┐
│ Are four signals output │──────▶│ Connect the PBX and     │
│ at the Tip-Ring?        │       │ TEL. line and go off-hook.│
└─────────────────────────┘       └─────────────────────────┘
             │ NO
             ▼
┌─────────────────────────┐  YES  ┌─────────────────────────┐
│ Is the signal at pins   │──────▶│ Check the trace         │
│ 3 of IC5 output?        │       │ between pins 3 of       │
└─────────────────────────┘       │ IC5 and Tip-Ring.       │
             │ NO                 └─────────────────────────┘
             ▼
┌─────────────────────────┐       ┌─────────────────────────┐
│ Check the solder at     │       │ Check the trace         │
│ pins 1~16 of IC5.       │       │ between T1 and pin      │
└─────────────────────────┘       │ 15 of IC5.              │
             │ OK                 └─────────────────────────┘
             ▼
┌─────────────────────────┐
│ Check the solder at     │
│ pins 70~81 of IC1.      │
└─────────────────────────┘
             │ OK
             ▼
┌─────────────────────────┐
│ Replace IC5.            │
└─────────────────────────┘
             │ NG
             ▼
┌─────────────────────────┐
│ Replace IC1.            │
└─────────────────────────┘
```

```
                          NO  ┌─────────────────────────┐
                        ◀─────│ Is the signal at pin 15 │
                              │ of IC5 dial tone input? │
                              └─────────────────────────┘
                                         │ YES
                                         ▼
                              ┌─────────────────────────┐
                              │ Check the solder at     │
                              │ pins 1~16 of IC5.       │
                              └─────────────────────────┘
                                         │ OK
                                         ▼
                              ┌─────────────────────────┐
                              │ Check the solder at     │
                              │ pins 70~81 of IC1.      │
                              └─────────────────────────┘
                                         │ OK
                                         ▼
                              ┌─────────────────────────┐
                              │ Replace IC5.            │
                              └─────────────────────────┘
                                         │ NG
                                         ▼
                              ┌─────────────────────────┐
                              │ Replace IC1.            │
                              └─────────────────────────┘
```

5. **Unit can copy, but cannot transmit/receive long distance or international communications**

The following 2 causes can be considered for this.

Cause 1:

The other party is executing automatic dialling, the call has been received by this unit, and the CED or DIS signal response time is too long. (In most cases, this unit detects the CNG signal and can respond to the CED or DIS.) (According to the ITU-T standard, the communication procedure is stopped when there is no response from the other party within 35 sec, so that the other party releases the line.)

(Response time)
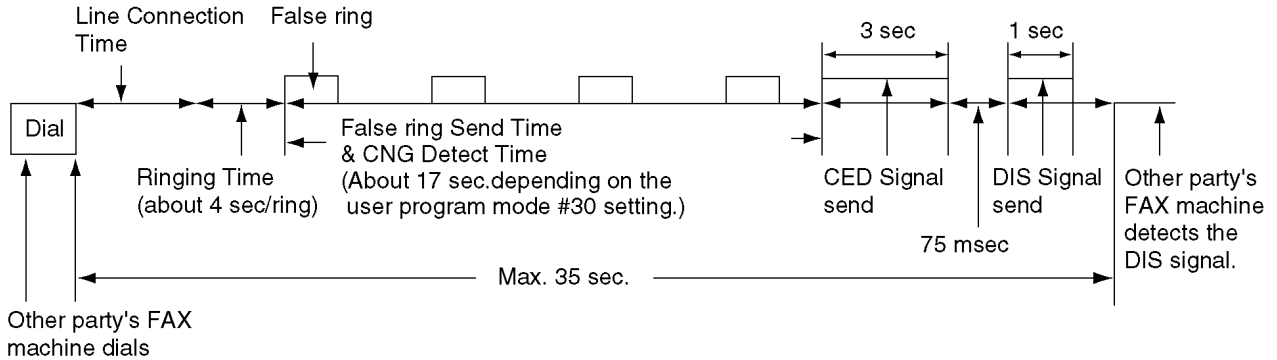
(Cause and Countermeasure)

As shown in the chart above, the total handshaking time must be reduced. Long distance connection and linking of several stations means the line connection time cannot be reduced. Accordingly, the following countermeasures should be attempted.
(A) The TEL/FAX DELAYED RING count should be 1. (User parameter: code No. 78)
(B) As the 35 sec. count starts directly after dialing or directly after the START button has been pressed for models with a START button, the other party should be called manually, if possible.
 Another possibility is entering two pauses at the end of the auto dial number on the transmission side. Then the count start time will be delayed for 2 pauses (about 10 sec.).

Cause 2:

Erroneous detection due to an echo or echo canceler.

The sea bottom cable or satellite
communication path (4 Line Type)
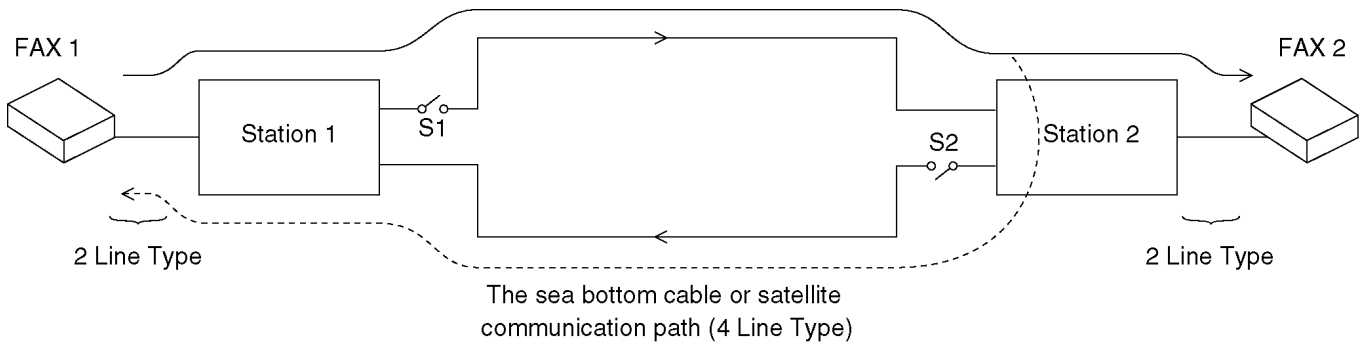
(Echo/Echo Canceler)

The signal from FAX1 reaches FAX2 via the stations 1 and 2, but the reflection signal at station 2 also returns via station 1(echo). As the distance between station 1 and station 2 is far, the echo returns to FAX 1 a max. of 600 msec after transmission. There is a possibility that this signal is detected erroneously as the signal from FAX2. For a normal call, there is a possibility that the echo of their own voice will make the call difficult to understand. For this reason, each station (station 1, station 2) attaches echo cancellers (S1, S2) for international lines or long distance lines. For the echo canceller, the level of the transmission signal from FAX 1 is compared with the level of the reception signal from FAX2. When the S1 is closed and S2 is open, so that the echo does not return to FAX1.

(Causes and Countermeasures)

(Cause A)

When a training signal is transmitted from FAX1 during the communication procedure at the time of transmission from FAX1 toFAX2, there is a delay until the echo canceler operates. S1 is closed so that a part of the head of the training signal may dropout. Normal reception by FAX2 may not be possible, and transmission may not be started.

(Countermeasure A)

When the international line mode is ON in the service mode (code No. 521), a dummy signal is attached to the head of the training signal to prevent this problem. As this normally is ON, it is necessary to reconfirm that this has not become OFF. When the international mode is switched OFF, the transmission side will try the training signal three times at each speed (9600BPS, 7200BPS, 4800BPS and 2400BPS). If NG, it will drop the speed by one rank (fall-back). When the international mode is switched ON, each speed will be tried only twice. In other words, the slower speed with fewer errors can be accessed more easily. This is done because the line conditions may deteriorate and the picture may be affected more easily during communication for international lines or long distance communication, even when the training is OK. The default value is ON as preference is given to clearer pictures rather than speed.

(Cause B)

The echo canceller operation is stopped with a 2100Hz signal (i.e. S1 and S2 become ON).
Accordingly, when FAX1 has executed automatic reception, a CED signal is output. If this signal is 2100Hz, S1 and S2 will become ON. Then the echo of the DIS signal output afterwards may be received and FAX1 may execute an erroneous operation, preventing communication from starting.

(Countermeasure B)

In the service mode, the time setting between the CED signal and the DIS signal is set from 75 msec to 500 msec in the service mode (code No.593). This is because the echo canceller operation stop mode is cancelled by an interval of 250 msec or more. Reduce receiving sensitivity to reduce the effect of RCV echo signal. (service mode: code No. 598)

(Cause C)

This model is FAX1 and the other party is FAX2.
For transmission from FAX1 to FAX2, FAX2 executes automatic reception and transmits a CED signal (2100 Hz) followed by a DIS signal. As the echo cancellers stops as described in cause B, the echo of the DIS signal returns to FAX2. On the other hand, FAX1 detects the DIS signal and transmits a DCS signal. In other words, it is possible that the echo of the DIS signal and the DCS signal transmitted from FAX1 reach FAX2 one after the other. FAX2 detects an error and communication is not started.

(Countermeasure C)

When the international DIS detection setting is set in the service mode (code No.594), FAX1 does not respond to the first DIS signal and returns a DCS signal only for the second DIS signal.
In other words, there is an interval of 250 msec between transmission of first and second DIS signal so that the echo cancellers operation recovers. An echo is not generated for the second DIS signal.

Note:

When the other FAX does not respond with a DCS signal after DIS signal transmission, the DIS signal is transmitted three times for trial.

Summary:

Long distance and international communication operation

SYMPTOM	COUNTERMEASURE
Does not receive in the automatic mode.	1. If possible, manual transmission should be made from the transmission side. 2. If possible, two pauses should be inserted at the end of the auto dial number on the transmission side. 3. If possible, the Function Selector Switch should be switched to FAX.
Does not transmit.	1. Confirm the international line mode is ON. (Service mode: code No. 521) 2. Enable the International DIS detection setting. (Service mode: code No. 594)
Does not receive.	1. Set the time setting between the CED signal and the DIS signal to 500 msec. (Service mode : code No. 593) 2. Reduce te RCV sensitivity. (Service mode : code No. 598)

6. **The unit can copy, but the transmission and reception image is incorrect**

   (Long distance or international communication operation)

   This depends widely on the transmission and reception capability of the other FAX unit and the line conditions.
   The countermeasures for this unit are shown below.

   Transmission Operation:

   Set the transmitting speed to 4800BPS (service mode: code No. 717) or select the overseas mode.

   Reception Operation:

   If 80% or more of the reception is incorrect, set the receiving speed to 4800BPS. (Service mode: code No. 718)

7. **How to output the Journal Report:**

   a. Press the MENU button 3 times.
   b. Press the START/COPY/SET button and then ▼ button 1 time.
   c. Press the START/COPY/SET button.
   d. All of the error lists will print out.

Sample of a journal report

```
    【 JORNAL 】
                                                25 Jan. 1999 05:22PM

    NO. OTHER FACSIMILE   START TIME      USAGE TIME  MODE  PAGES   RESOLT            *CODE
    01  3332222          21 Jan. 02:14PM 00'45       SND   01      OK
    02  9998765          21 Jan. 03:17PM 00'58       RCV   02      OK
    03  John             21 Jan. 05:18PM 00'48       RCV   01      OK
    04  555556677        22 Jan. 10:35AM 02'45       SND   03      COMMUNICATION ERROR    (43)
    05                                   02'50       SND   05      OK
                                                     RCV   03      OK
```

(3)
SND: Sent directly
RCV: Recived directly

(2) Communication massage

(1) Error code

8 **Error code table:**

(1) CODE	(2) RESULT	(3) MODE	SYMPTOM	Counter-measure
	PRESSED THE STOP KEY	TX & RX	Communication was interrupted by the STOP button.	
	DOCUMENT JAMMED	TX	The document paper is jammed.	
	NO DOCUMENT	TX	No document paper.	
	PRINTER OVERHEATED	RX	The thermal head is overheated.	
	PAPER OUT	RX	Out of thermal paper or the cover is open.	
40	OTHER FAX NOT RESPOND	TX	Transmission is stopped when the T1 TIMER expires.	
41	COMMUNICATION ERROR	TX	DCN is received after DCS transmission.	1
42	COMMUNICATION ERROR	TX	FTT is received after transmission of 2400BSP training signal.	2
43	COMMUNICATION ERROR	TX	No response after post message is transmitted three times.	3
44	COMMUNICATION ERROR	TX	RTN and PIN are received.	4
46	COMMUNICATION ERROR	RX	No response after FTT is transmitted.	5
48	COMMUNICATION ERROR	RX	No post message.	6
49	COMMUNICATION ERROR	RX	RTN is transmitted.	7
50	COMMUNICATION ERROR	RX	PIN is transmitted (to PRI-Q).	8
51	COMMUNICATION ERROR	RX	PIN is transmitted.	8
52	OTHER FAX NOT RESPOND	RX	Reception is stopped when the T1 TIMER expires.	8

(1) CODE	(2) RESULT	(3) MODE	SYMPTOM	Counter- measure
53	ERROR-NOT YOUR UNIT	TX	DCN is received after transmission of NSC and DTC.	9
54	ERROR-NOT YOUR UNIT	RX	DCN is received after DIS transmission.	10
57	COMMUNICATION ERROR	TX	300BPS error	11
58	COMMUNICATION ERROR	RX	DCN is received after FTT transmission.	12
59	ERROR-NOT YOUR UNIT	TX	DCN responds to a post message.	13
64	COMMUNICATION ERROR	TX	Polling is not possible.	14
68	COMMUNICATION ERROR	RX	No response at the other party after MCF or CFR is transmitted.	15
70	ERROR-NOT YOUR UNIT	RX	DCN is received after CFR transmission.	13
72	COMMUNICATION ERROR	RX	The carrier is cut when the image signal is received.	13
FF	COMMUNICATION ERROR	TX & RX	Modem error.	12

TX=TRANSMISSION RX=RECEPTION

Most fax communication problems can be resolved by the following steps.
  a. Change the transmit level. (Service code: 596, refer to **2.4.4. Service Function Table**.)
  b. Change the TX speed/RX speed. (Service code: 717/718, refer to **2.4.4. Service Function Table**.)
If the problem remains, see the next page.

Countermeasure

1 — Transmission is stopped when the T1 TIMER expires.

Turn ON the FAX monitor function and transmit the data to the same receiver.

Is the FAX signal sound (DIS) heard?

NO

YES

Is communication OK?

NO

YES

Confirm if the receiver's FAX machine is set to the reception mode or the answering machine's message is on.

Confirm the service parameter and compatibility of both the caller's and receiver's FAX machines.

Confirm if the receiver's FAX machine was set to the reception mode when the previous communication was NG.

2 — DCN is received after DCS transmission.
DCN is received after FTT transmission.
Reception is not EOP, EOM PIN, RTP or RTN.

Confirm the receiver's FAX machine.

Is it the same brand as your unit?

NO

YES

Is the receiver's FAX machine in the "out of paper or mechanical error" status?

NO

Ask the receiver to cancel the password of the receiver's FAX machine or set the caller's password corresponding to the receiver's, and transmit the data again.

YES

Ask the receiver to set the receiver's FAX machine to the receive mode and transmit again.

Confirm the service parameter and compatibility of both the caller and receiver's FAX machines.

```
┌──────────┐        FTT is received after the transmission of a 2400BPS
│    3     │        training signal.
└────┬─────┘
     │
┌────▼──────────────────────┐
│ Perform the communication │
│ test using the LOOP       │
│ simulator.                │
└────┬──────────────────────┘
     │
     ▼
  ◇ Is "Fall back" executed from ◇ ──── YES
     9600BPS?
     │ NO
     │         ┌────────┐
     ◄─────────┤  3.1   │
     │         └────────┘
```

Modem test
(TEST CODE NO.554)

(1) Raise the level of transmission. (Do not raise the level above the standard of each country. If the communication is OK at the level beyond the standard, it is due to the line condition or the receiver's machine sensitivity.)
If no effect is obtained:
(2) Slow down the transmission start speed and transmit to the receiver again.

Is communication OK? ──── YES

3.2

NO

Ask the receiver to perform the FAX communication from the receiver to the caller.

If this error frequently occurs at the receiver, perform transmission in the above mentioned mode on the receiving side.

Is communication OK? ──── YES

NO

Perform voice communication with the receiver.

End

Check if the line is not interrupted by noises or cross talk. If not, wait until the line is satisfactory for correct communication.

43

4   No response after the post message is transmitted three times.

Inquire with the receiver if the caller's document has been sent correctly.

Is the data sent correctly? — NO → **3.2**

YES

Ask the service section for the receiver's FAX machine to confirm the machine condition.

5   RTN and PIN are received.

3.1

6   No response after FTT is transmitted.

Perform the communication test using the LOOP simulator and check the machine reception condition.

Modem test
(TEST CODE NO.554) ← YES — Is FTT sent from the receiver?

NO

6.1

No problem with the machine hardware.

Perform voice communication with the NG caller.

Check if the line is not interrupted by noises or cross talk. If not, wait until the line is satisfactory for correct communication.

7   No post message

Turn ON the FAX monitor function and have the receiver transmit the data.

Is the FAX signal sound (post message) heard after the image data is received?

7.1

NO

Ask the service section for the sender's FAX machine to examine the unit.

YES

(Receive Completed)

NO   Does an error (error code=48) still occur?   YES

Try again.

Decrease the RX speed.

Does an error line exist on the received document?

NO

7.1

YES

8   RTN is transmitted.
PIN is transmitted (to PRI-Q).
PIN is transmitted.

Perform the communication test using the LOOP simulator and check the machine reception condition.

Is the data sent correctly?

NO

Modem test
(TEST CODE NO.554)

YES

Turn ON the FAX monitor function and have the receiver transmit the data again.

Does the communication error "code 49" occur?

YES

6.1

NO

End

45

9

Reception is stopped when the T1 TIMER expires.

Perform the communication test us-ing the LOOP simulator and check the machine reception condition.

Is the data sent correctly?

NO → Modem test (TEST CODE NO.554)

YES

Turn ON the FAX monitor func-tion and have the receiver transmit the data again.

Is communication OK?

YES → End

NO

Is the FAX signal sound heard after the image data is received?

NO → Confirm if the receiver's FAX machine was set to the receivable mode.

YES

6.1

10 DCN is received after the transmission of NSC and DTC.

Confirm if a mechanical problem occurred. E.g., transmission was interrupted or the document was out of place on the receiver side (being polled).

Was it a mechanical error as mentioned above?

NO

YES

Ask the receiver to set the poll mode again and perform polling.

Ask the service section for the receiver's FAX machine to examine the unit.

11 DCN is received after DIS transmission.

Confirm if a mechanical problem occurred. E.g., the caller interrupted the transmission.

Was it a mechanical error as mentioned above?

NO

YES

Have the caller transmit the data again.

Ask the service section for the caller's FAX machine to examine the unit.

12 300BPS error
Modem error

Check the hardware peripherals of the modem.

13

DCN is received after FTT transmission.
No response at the other party after MCF or
CFR is transmitted.
DCN is received after CFR transmission.

Confirm if a mechanical problem
occurred. E.g., the caller inter-
rupted the transmission.

Was it mechanical error as
mentioned above? — NO → **6.1**

YES

Ask the caller to transmit the
data again.

14

DCN responds to the post message.

Confirm if a mechanical problem
occurred. E.g., the receiver inter-
rupted the reception.

Was it a mechanical error as
mentioned above? — YES

NO

Perform voice communication
with the NG receiver.

Ask the receiver to set the
receiver's FAX machine to the
receivable mode and
communicate again.

Check if the line is not inter-
rupted by noises or cross talk.
If not, wait until the line is
satisfactory for correct com-
munication.

15   Polling is not possible.

Confirm if a mechanical problem occurred. E.g., transmission was interrupted or the document was out of place on the receiver side (being polled).

Was it mechanical error as mentioned above?

NO

YES

Ask the receiver to set the Poll mode again and perform polling.

Ask the service section for the receiver's FAX machine to examine the unit.

16   The carrier is cut when the image signal is received.

Perform the communication test using the LOOP simulator and check the machine reception condition.

Modem test (TEST CODE NO.554)

YES

Is the carrier cut?

NO

6.1

49

2.3.4.2.2. Remote programming

If, after the call is connected, the customer describes the situation and it is determined that the problem can be corrected by making parameter changes, this function makes it possible to change parameters such as the user code and service code from another fax (using DTMF tones). Therefore, travel to the customer´s location is not required. However, it is not possible to change all the parameters remotely (**2. Program mode table**). The function used to accomplish this is remote programming.

First, in order to check the current status of the service code parameter, out put the setup list (code: 991) and service list (code: 999) from the customer´s fax machine. Based on this, the parameters for the desired codes can be changed. The procedure for changing and listing parameters is described on **1. Entering the remote programming mode and Changing service codes.** Also, before exiting the remote programming mode, it is advisable to obtain a new list to confirm that only the desired parameters were changed.

Hint:

Since the connected telephone is in use during the remote programming mode, it may be helpful to ask the customer to switch to the speakerphone (except for a digital speakerphone). This frees the customer from the need to remain right next to the fax while you are making parameter settings. When finished, inform the customer. Also note that in very noisy locations where the DTMF tones are not audible, the remote programming function will not work.

1. Entering the remote programming mode and changing service codes

---

After the call is connected,
ask the user to press the MENU button.

If the user is talking with speaker phone,
ask the user to lift the handset.

↓

Enter the remote programming ID: "9, 0, 0, 0, ✳".

↓

A high-pitched beep ("Piii") sounds to indicate that
the remote programming mode has been activated.

If nothing is audible, enter "9, 0, 0, 0, ✳"
again.

↓

Enter the 3 digit code (2 Program mode table)
of the desired service function and then press
✳ (set).

↓

A high-pitched beep ("Piii") sounds to indicate that
the service setting mode has been activated.

Three short high-pitched beeps ("Pi Pi Pi") sound if
an invalid code was entered. If this happens,
reenter the correct code.

↓

Enter the 1 to 3 digit code (2 Program mode
table) of the desired function and then press
✳ (set).

Three short high-pitched beeps ("Pi Pi Pi") sound if
an invalid value was entered. If this happens,
reenter the correct value.

↓

Two short high-pitched beeps ("Pi Pi") sound to
indicate that the setting is complete.

To make another setting

Obtain a list (991: Set up list, 999: Service list) to confirm that the changes
were made correctly.

To quit the remote programming mode, ask
the customer (the call should still be
connected) to press the STOP key to return
the machine to the normal mode.
Then hang up the phone.

→ END

2. **Program Mode Table**

Code	Function	Set Value	Default	Remote setting
001	Set the date and time	mm/dd/yy hh:mm	---------	NG
002	Your logo	---------	---------	NG
003	Your telephone number	---------	---------	NG
004	Print transmission report	1:ERROR 2:ON 3:OFF	ERROR	OK
007	FAX ring count	1 to 4 rings	2 ring	OK
013	Dialing mode	1:PULSE/2:TONE	TONE	OK
022	Journal auto print	1:ON 2:OFF	ON	OK
023	Overseas mode	1:ON 2:OFF	OFF	OK
025	Delayed send	ON/OFF	OFF	NG
030	Silent FAX recognition ring	3 to 9 rings	3 rings	OK
031	Ring detection	1:A 2:B 3:C 4:D 5:OFF	OFF	OK
041	FAX activation code	ON/OFF	ON/ID=*9	NG
046	Friendly reception	1:ON 2:OFF	ON	OK
049	Auto disconnect	1:ON 2:OFF	ON/ID=*0	---------
058	Original setting	1:NORMAL/2:LIGHT/3:DARKER	NORMAL	OK
070	FAX pager	ON/OFF	OFF	NG
076	Connecting tone	1:ON 2:OFF	ON	OK
077	Auto answer mode	1:FAX ONLY/2:TEL/FAX	FAX ONLY	OK
078	TEL/FAX delay ring	1 to 4 rings	1	OK
080	Set the default	YES/NO	NO	NG
501	Pause time set	001~600 X 100 msec	050	OK
502	Recall time set	01~99 X 10 msec	70	OK
503	Dial speed set	1:10pps 2:20 pps	10	OK
520	CED frequency select	1:2100Hz 2:1100Hz	2100	OK
521	International mode select	1:ON 2:OFF	ON	OK
522	Auto standby select	1:ON 2:OFF	ON	OK
523	Receive equalizer select	1:ON 2:OFF	OFF	OK
524	SND EQL.	1:ON 2:OFF	OFF	OK
544	Document feed position adjustment value set	01~99 step	---------	OK
550	Memory clear	Press "START".	---------	NG
551	ROM check	Press "START".	---------	NG
553	Monitor on FAX communication select	1:OFF 2:P-B 3:ALL	OFF	OK
554	Modem test	Press "START".	---------	NG
555	Scanner test	Press "START".	---------	NG
556	Motor test	Press "START".	---------	NG
557	LED test	Press "START".	---------	NG
558	LCD test	Press "START".	---------	NG
559	Document jam detection select	1:ON 2:OFF	ON	OK
561	Key test	Press any key.	---------	NG
563	CCD position adjustment value set	00~30 mm	---------	OK
570	Break % select	1:61% 2:67%	61%	OK
571	ITS auto redial time set	00~99	014	OK
572	ITS auto redial line disconnection time set	001~999 set	030	OK
573	Remote turn-on ring number set	01~99	15	OK
590	FAX auto redial time set	00~99	05	OK
591	FAX auto redial line disconnection time set	001~999	045	OK
592	CNG transmit select	1:OFF/2:ALL/3:AUTO	ALL	OK
593	Time between CED and 300 bps	1:75/2:500/3:1s	75 ms	OK
594	Overseas DIS detection select	1:1st/2:2nd	1st	OK
595	Receive error limit value set	001~999	100	OK
596	Transmit level set	15~00dBm	-10	OK
598	Modem sesitivity	20~48	45	OK
717	Transmit speed select	1:9600/2:7200/3:4800/4:2400bps	9600bps	OK
718	Receive speed select	1:9600/2:7200/3:4800/4:2400bps	9600bps	OK
719	Ringer off in TEL/FAX mode	1:ON/2:OFF	ON	OK
721	Pause tone detect	1:ON/2:OFF	ON	OK
722	Redial tone detect	1:ON/2:OFF	ON	OK
763	Friendly reception CNG detection select	1:10S/2:20S/3:30S	20S	OK
771	T1 timer	1:35 sec/2:60 sec	35 sec	OK
774	T4 Timer	00~99 (X100ms)	00	OK
815	Sensor check	Press "START".	---------	NG
844	Original setting	1:NORMAL/2:LIGHT/3:DARKER	NORMAL	OK
991	Transmit basic list	1: START	---------	OK
992	Transmit advanced list	1: START	---------	OK

Code	Function	Set Value	Default	Remote setting
994	Transmit journal report	1: START	---------	OK
996	Journal 3	1: START	---------	OK
999	Transmit service list	1: START	---------	OK

OK : Can set the value by the remote programming feature or print a list.

NG : Cannot set the value.

Note:

    Note: Refer to **2.4.4. SERVICE FUNCTION TABLE** for descriptions of the individual codes.

For example, the "004 Transmission report mode" set value "1:ERROR/2:ON/3:OFF" number corresponds to the number dialled.

Code	Function	Set Value	Default	Remote setting
994	Transmit journal report	1: START	---------	OK
996	Journal 3	1: START	---------	OK
999	Transmit service list	1: START	---------	OK

2.3.4.3. Digital Board Section

One of most difficult problems to deal with is when the system will not boot up.

The symptom: No response when the power is turned on. (No LCD display, keys are not accepted.)

Then first thing to do is check the power source, If there is no problem with the power supply unit, then there is a problem with the digital unit (main board).
As there are many potential causes in this case (ASIC, etc.), it may be difficult to specify what you should check first. If a mistake is made in the order of checks, a normal part may be determined faulty, wasting both time and money.
Although the tendency is to regard the problem as a serious one (IC malfunction, etc.), usually most cases are caused by solder faults (poor contact due to a tunnel in the solder, signal short circuit due to solder waste).

SMT PARTS

cold soldering

SMT PARTS

solder ball

SMT PARTS

solder waste

LEADED PARTS

(section)

cold soldering

CHIP PARTS (section)

cold soldering

RESISTOR ARRAY

cold soldering
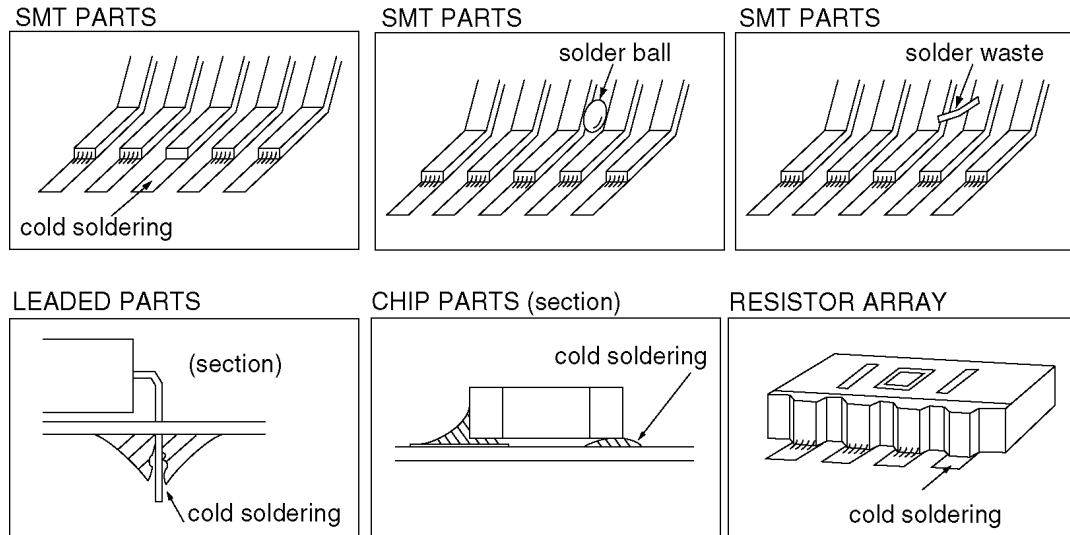
Note:

1. Electrical continuity may have existed at the factory check, but a faulty contact occurred as a result of vibration, etc., during transport.
2. Solder waste remaining on the board may get caught under the IC during transport, causing a short circuit.

Before we begin mass production, several hundred trial units are produced at the plant, various tests are applied and any malfunctions are analyzed. (In past experiences, digital IC (especially SRAM and ROM) malfunctions are extremely rare after installation in the product.)
This may be repaired by replacing the IC, (ASIC etc.). However, the real cause may not have been an IC malfunction but a soldering fault instead.
Soldering faults which are difficult to detect with the naked eye are common, particularly for an ASIC and RA (Resistor Array). But if you have an oscilloscope, you can easily determine the problem site or IC malfunction by checking the main signal lines.
Even if you don´t have such a measuring instrument, by checking each main signal line and resoldering it, in many cases the problem will be resolved.
An explanation of the main signals (for booting up the unit) is below.

> Don't exchange ICs or stop repairing until checking the signal lines.
> An IC malfunction rarely occurs. (By understanding the necessary signals for booting up the unit, the "Not Boot up" display is not a serious problem.)

What are the main signals for booting up the unit?

Please refer to the **2.3.4.3.1. Digital Block Diagram**.
The ASIC (including the CPU) (IC1) controls all the other digital ICs. When the power is turned on, the ASIC (CPU) retrieves the operation code stored in the ROM (IC2), then follows the instructions for controlling each IC. All ICs have some inner registers that are assigned to a certain address.
It is the address bus by which the ASIC (CPU) designates the location inside each IC. And the data bus reads or writes the data in order to transmit the instructions from the ASIC (CPU) to the ICs.
These signal lines are all controlled by voltages of 5V (H) or 0V (L).

ROM (IC2)

A0-17

D0-7

RD

SRAM (IC3)

A0-17

D0-7

RD

WR

ANALOG FRONT END (IC5)

TXOUT

RXIN

ANALOG PORT CONTROL
I/O

TO ANALOG

ANALOG SW
(IC6)

TX

RX

H/S RX

H/S TX

TO ANALOG

SP

+24V

IC7

LED ON

+5V

TO
CIS

CLK, SIG

24V

Q13

TO
THERMAL HEAD

STBI-2,THLAT

THCLK,THDAT

20.736MHz

RD   WR   A0-17   D0-7

ASIC
IC1

CIS-CTL

TH ON
HEAD-CTL

XWDERR

VOL

XRESETI

32.768KHz   24MHz

5V

(IC4)

RESET
BACK UP

KSTART,KLATCH,KSCLK,KTXD,KRXD,KIN0,KIN1,KIN2,KIN3
RS,E

TO
OPE PANEL

TO
MOTOR

(IC7)

MOTOR
DRIVER

T0,T2~T5

TO SRAM (IC3)

The signal lines that must be normal for the system to boot up are listed here [List 1].
For signal lines other than these, even if they malfunction they do not directly affect booting up the system.

[List 1]

(1)	D0~D7	(Address/Data Bus)
(2)(3)	A0~A16	(Address Bus)
(4)	$\overline{RD}$	(Read Signal)
(5)	$\overline{ROMCS}$	(ROM Select Signal)
(6)	$\overline{MDMCS}$	(MODEM Select Signal)

If these signals are normal, once the power is turned on, each IC repeatedly outputs 5V or 3.3V (H) and 0V (L). The following page shows NG and normal wave patterns.

NG Wave pattern (Refer to NG EXAMPLE)

0V never appears.

5V or 3.3V

NG

5V never appears.

NG

0V
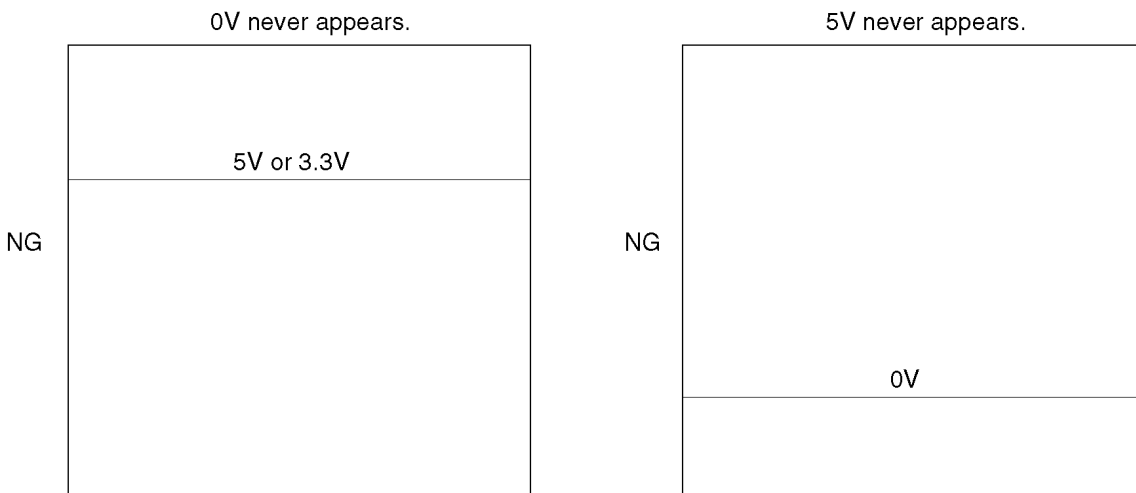
For a short between D0 and D1

1.00 V   M 400ns A Ch1 ∫   1.50 V
0.00000 s

56

OK

(1) D0~D7   200ns/div, 1V/div

(2) A0~A7   200ns/div, 1V/div

(3) A8~A16   200ns/div, 1V/div

(4) $\overline{RD}$ 100ns/div, 1V/div

(5) $\overline{ROMCS}$ 500ns/div, 1V/div

(6) $\overline{MDMCS}$ 500ns/div, 1V/div
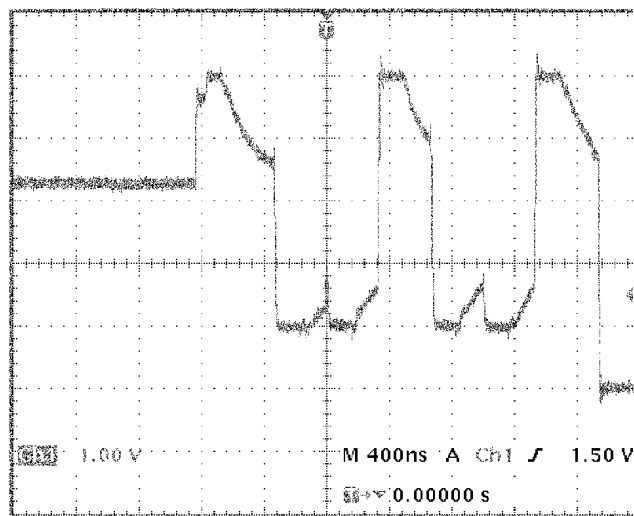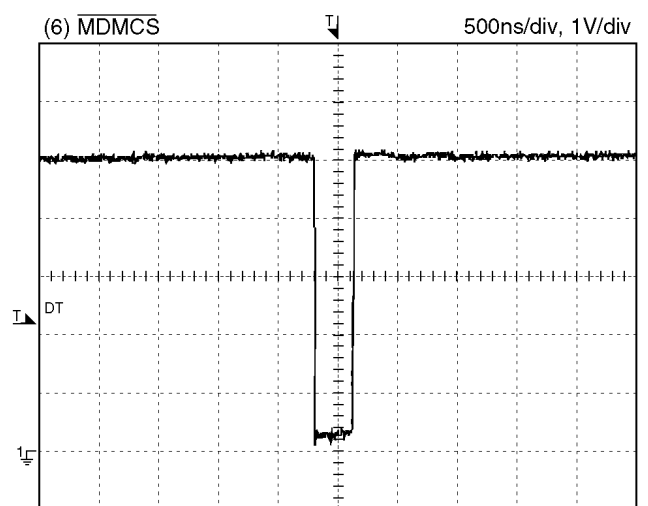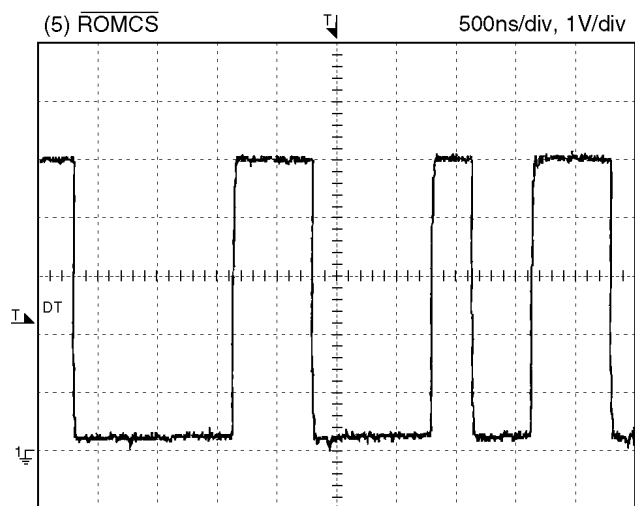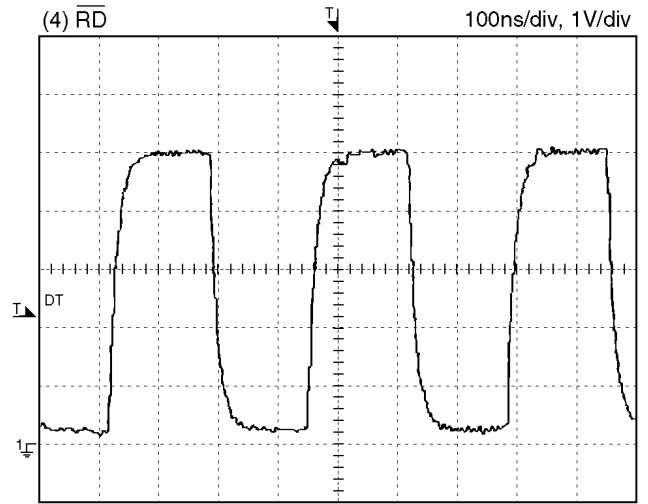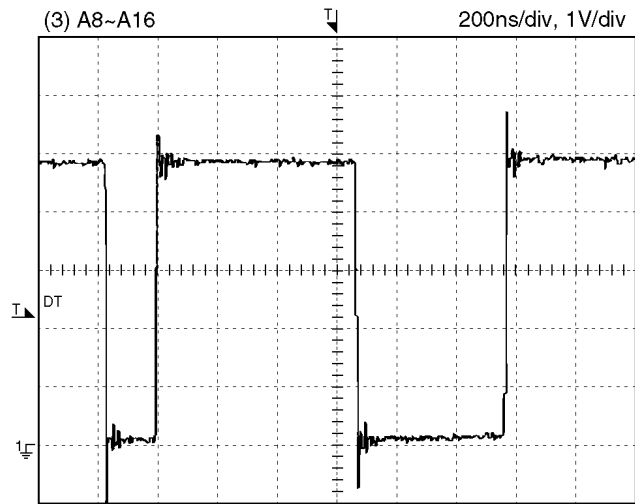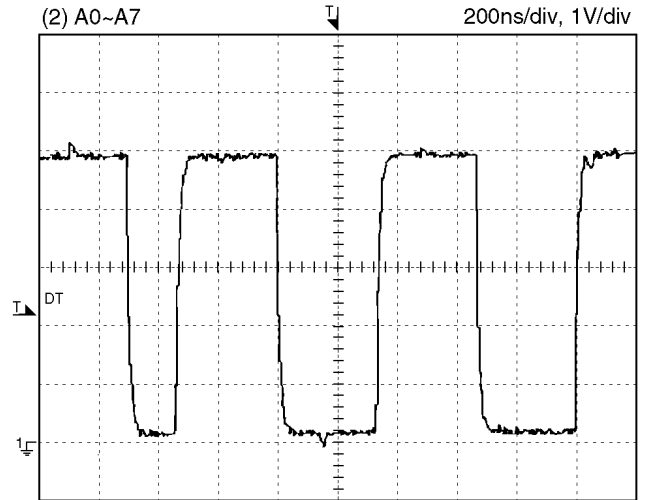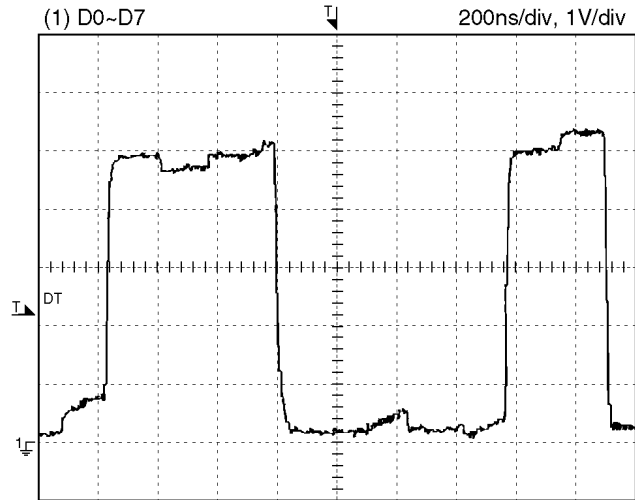
For these reasons and the software sequence to boot up the unit, if you use an oscilloscope to judge whether a signal is OK or NG, you must check in the same order as in [List 1]. (If the ASIC (CPU) failed to access the ROM, the ASIC cannot access the SRAM or DRAM normally.)

The digital circuit actually operates according to the timing combinations of these signals. So, if the timing of these signals is even slightly off, the circuit will not operate normally. Even of the IC did malfunction, the output voltage level may become abnormal but the timing is accurate according to the specifications. (If oscillation is provided accurately.)
Accordingly, the problem presented here is whether each IC outputs the correct signal. (See the I/O and Pin No. diagram.) In other words, is it constantly switching between 5V or 3.3V (H) and 0V (L) as described earlier.

All you have to do is check that the IC repeatedly outputs (H) 5V or 3.3V and (L) 0V.

I/O and Pin No. Diagram
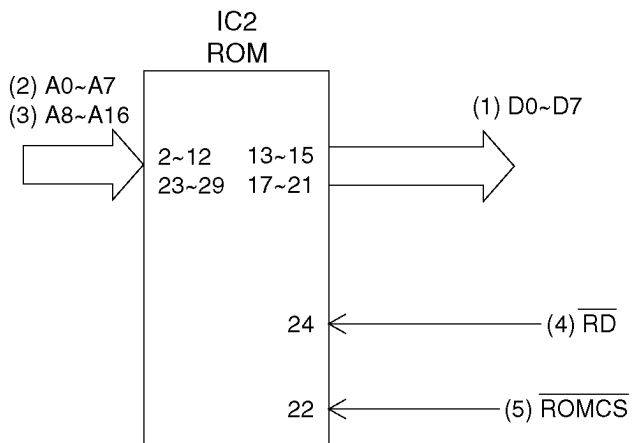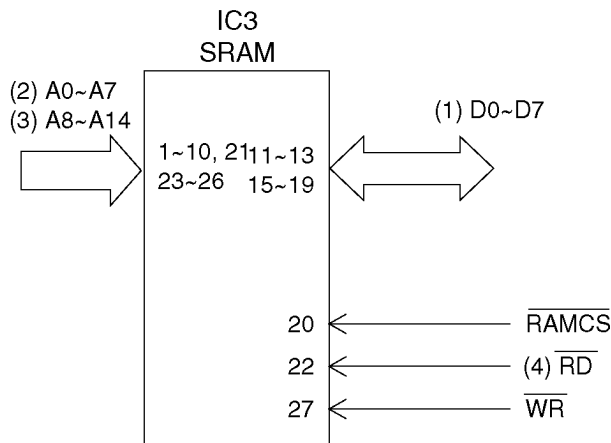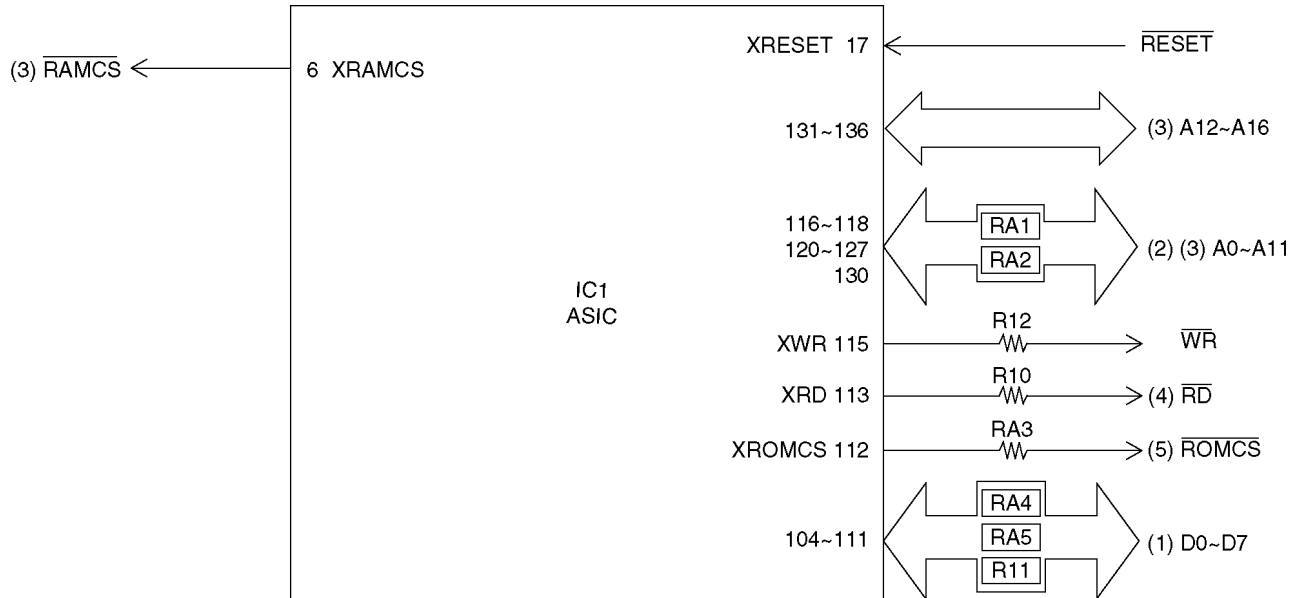
After the power is turned on, the ASIC (CPU) initializes and checks each IC.

The ROM, SRAM, and Modem are checked.

If initialization fails for the ICs, the system will not boot up.

```
                    ┌──────────────────────────────┐
                    │         AC POWER ON          │
                    └──────────────────────────────┘
[1] Power check                     │
                                    ▼
                    ┌──────────────────────────────┐  NG   ┌──────────────────────────────┐
                    │ +5 V:  Is there +5 V at pin 7 │──────▶│ Problem with the power supply │
                    │ of CN1?                       │       │ unit.                        │
                    └──────────────────────────────┘       └──────────────────────────────┘
                                    │
                                    ▼
                    ┌──────────────────────────────┐  NG   ┌──────────────────────────────┐
                    │ +3.3 V: Is there +3.3 V at Q2 │──────▶│    Check Q2, Q3 and Q1.      │
                    │ CORRECTOR?                    │       └──────────────────────────────┘
                    └──────────────────────────────┘
[2] Oscillation                     │
                                    ▼
                    ┌──────────────────────────────┐
                    │         X3=24MHz             │        ※Check IC1 (ASIC) 82 pin = 6MHz.
                    └──────────────────────────────┘
[3] Reset                           │ OK
```

Reset: IC1 (ASIC) 14 pin

Ⓐ WDERR   Ⓑ Constant 0V   Ⓒ Constant 5V

Ⓐ
5V
4mS
0V

Ⓑ Constant 0V → Check the reset signal line and reset IC (IC4).

Ⓒ Constant 5V → Check the status by test types A, B, C and D. Refer to **2.3.4.3.2. Check the Status of the Digital Board**.

ⒶWDERR

[4] Check each signal line.

Use this order.

(1) D0~D7
(2) A0~A16
(3) $\overline{RD}$
$\overline{ROMCS}$
$\overline{WR}$
$\overline{RAMCS}$

NG → "See **NG Example**"

OK

Go to **next page**.

When all waveforms are OK.

RESET

3.3V

Reconfirm RESET.

LCD display

NG → Check the LCD.

OK

OK

WDERR

RESET

Example

IC malfunction

ASIC

× Chip

Open the circuit inside.
Replace the CPU.

Other NG examples while the power is ON and the LCD displays the following.

LCD display   CALL SERVICE → This display occurs when the temperature of the thermistor
on the terminal head is NG.
Faulty connection of the thermal head connector.

ASIC IC1 pins 193 and 207 or the thermistor on the thermal head is NG.
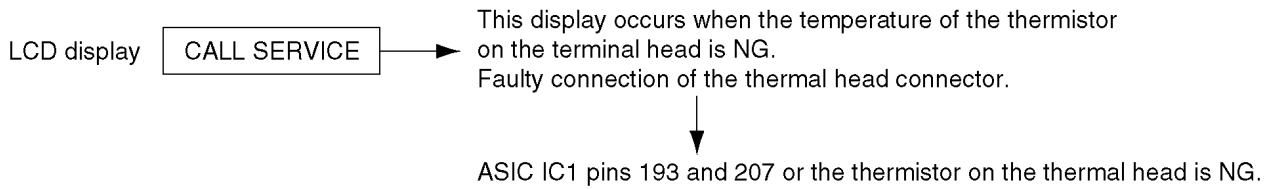
NG Example

1.

5V or 3.3V

0V
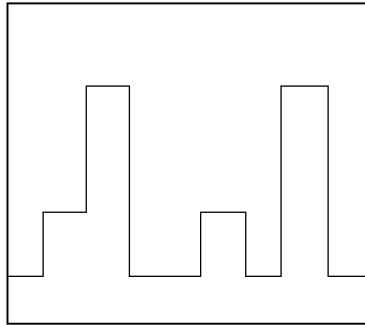
Short circuit from the adjacent signal wires.
Check for a short circuit in the RA and IC leads and the signal wire at the through hole.

Solder waste

Solder ball

470

Through hole
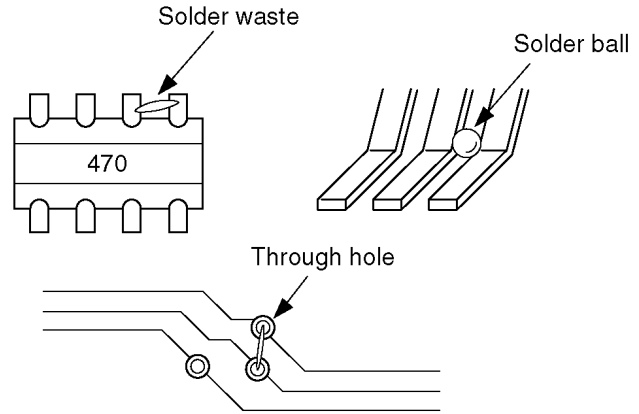
2.
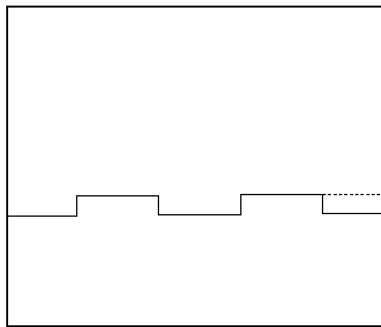
Short between the signal line and GND.
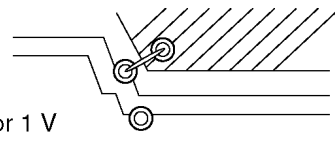
Approx. 0 or 1 V

OR   IC malfunction

IC3

IC1   Chip

3.

0V

ASIC   RA   SRAM
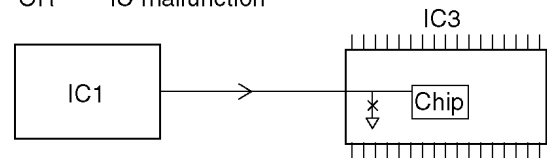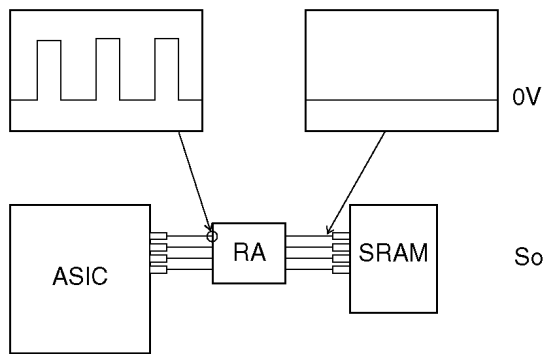
Solder fault on RA.

2.3.4.3.2. Check the Status of the Digital Board

Put the unit in the test mode and check the voltage at lands A, B, C and D.
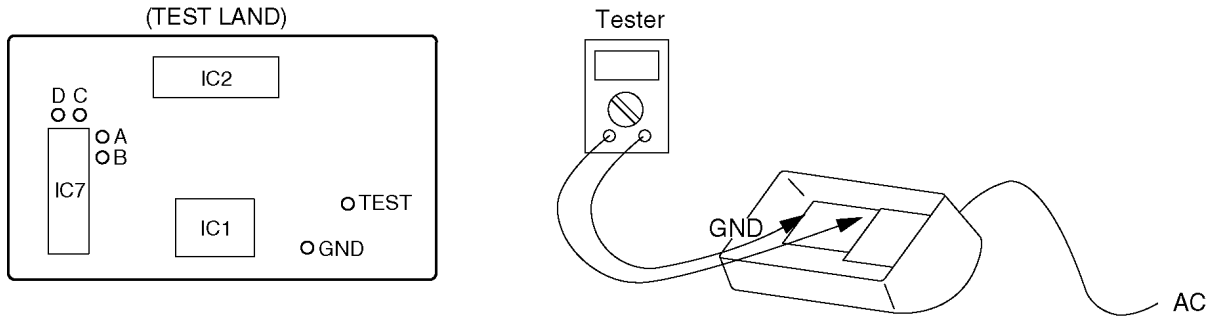
Turn off the power supply.
Short using a metallic object, such as tweezers, between the test and GND land, and turn on the AC power.
Check the following voltages by using an oscilloscope or tester.
To cancel the status check mode, turn off the AC power.

Item	Check point voltage				Check points
	A	B	C	D	
CLOCK(IC1)	5V	0V	0V	0V	IC1
MODEM(IC1)	0V	5V	0V	0V	IC1
S-RAM(IC3)	0V	0V	5V	0V	IC3 (20 pin), IC1 (6 pin), IC3
ASIC(IC1)	0V	0V	0V	5V	RA1~RA4, R10,12, IC1 (104~136 pins)
ALL OK	5V	5V	0V	0V	

This indicates that the Add/Data Bus, RAM, ROM, MODEM, and ASIC are all completely connected to the CPU and that control from the CPU is possible.

Please check the soldering and conduction of these components.
If there is no problem, replace the ICs.

If you still have a problem with the digital board, refer to **NG wave pattern**.

To cancel the status check mode, turn off the AC power.

2.3.4.4.   Analog Board Section

The analog parts check is actually different than the digital parts check. The signal route is determined by the purpose of the check. For example, the handset TX route begins from the handset microphone and is output in the telephone line. In this route, it is mainly an analog signal. Tracing the signal can be done easily using an oscilloscope. Each route is shown on the Check Sheet here. If there is a problem with the unit (for example, you cannot communicate with the H/S, etc.), trace the signal in the area and determine the cause.

CHECK SHEET

(SYMPTOM) ITEMS TO CHECK	signal ROUTE IN ➤ OUT

Monitor
TEL LINE-T101-R104-C107-R112-IC101(6-7)-C127-IC103(11-10)-CN102(10)-{CN9(10)-IC6(3-4)-C52-R42-IC8(2-1)-C27-R13-IC1(62-63)-C62-IC8(5-7)-C67-CN10(9)}-CN202(9)-R122-IC102(4-5, 8)-CN101(1, 2)-SPEAKER

Handset Tx
MIC┬L201-C207-R205┬IC201(5, 6-7)-C212-R212-C214-R217-IC201(2-1)-C219-C220-R225-CN202(8)-
     └L204-C206-R204┘
{CN10(8)-R62-C66-C60-R51-IC9(6-7)-CN10(1)}-CN202(1)-C106-R103-R102-T101-TEL LINE

Handset Rx
TEL LINE-T101-R104-C107-R112-IC101(6-7)-C127-IC103(11-10)-CN102(10)-{CN9(10)-IC6(3-4)-C52-R42-IC8(2-1)-C27-R13-IC1(62-63)-C62-IC8(5-7)-R60-C63-IC6(8-9)-C65-CN10(10)}-CN202(10)-J402-C234-R209-Q201(B-E)-C205┬── L202 ──┬CN201(2, 3)-H/S SPEAKER
                                                            └C202-L203┘

DTMF

    Monitor
{IC5(3)-C48-R37-R38-IC9(2-1)-C54-R44-IC8(2-1)-C27-R13-IC1(62-63)-C62-IC8(5-7)-C67-CN10(9)}-CN202(9)-R122-IC102(4-5, 8)-CN101(1, 2)-SPEAKER

    Handset
{IC5(3)-C48-R37-R38-IC9(2-1)-C54-R44-IC8(2-1)-C27-R13-IC1(62-63)-C62-IC8(5-7)-R60-C63-IC6(8-9)-C65-CN10(10)}-CN202(10)-J402-C234-R209-Q201(B-E)-C205┬──L202 ──┬CN201(2, 3)-H/S SPEAKER
                                                                            └C202-L203┘

DTMF TEL LINE
FAX Tx
DUMMY Ring Back Tone
{IC5(3)-C48-R37-R38-IC9(2-1)-C53-IC6(2-1)-C58-R49-IC9(6-7)-CN10(1)}-CN202(1)-C106-R103-R102-T101-TEL LINE

Ringing/Alarm Beep/Keytone
{IC1(59)-R28-C45-R35-IC8(2-1)-C27-R13-IC1(62-63)-C62-IC8(5-7)-C67-CN10(9)}-CN202(9)-R122-IC102(4-5, 8)-CN101(1, 2)-SPEAKER

FAX Rx
TEL LINE-T101-R104-C107-R112-IC101(6-7)-C127-IC103(11-10)-CN102(10)-{CN9(10)-IC6(10-11)-R33-C43-IC5(15)}

DTMF detection
TEL LINE┬RLY1(3-2)┬C13-R19┬T102-C116-R116-IC10(2-1)-C126-IC103(3-4)-CN102(10)-{CN9(10)-
         └RLY1(6-7)┘   └C14┘
EXT. TEL┬L5────┤
         └L6-R16-R20┘
IC6(10-11)-R33-C43-IC5(15)}

Note:

   { }: Inside the digital board

1. **Defective ITS (Integrated Telephone System) Section**

a. No handset and monitor transmission/reception

Following the ITS section or ECU section, search for the route between the microphone and
the telephone line (sending) or between the telephone line and the speaker (receiving) where the signal disappears.
Check the components at that point.

b. No pulse dialling

| Does pin 99 of IC1 on the digital board change from high to low level? | NO → | Replace Q2 on the analog board. | NO → | Does pin 99 of IC1 on the digital board change from high to low level? | NO → | Check IC1 on the digital board. |

YES ↓

| Does the base Q2 on the analog board change from high to low level? | NO → | Check the conduction between the base of Q2 on the analog board and pin 99 of IC1 on the digital board. |

YES ↓

Check RLY1 on the analog board.

c. Not ring tone

| With the unit on-hook (standby), does a bell ring when pins 3-4 of PC5 on the analog board are shorted? | NO → | Is a current flowing between pin 4 of PC5 on the analog board and pin 56 of IC1 on the digital board? | NO → | Check the path between pin4 of PC5 on the analog board and pin 56 of IC1 on the digital board. |

YES ↓ (left)   YES ↓ (middle)

Check the bell detect circuit (R16, R18, C12, PC5 etc.) on the analog board.

Check the path over which the bell signal is sent to the speaker.

d. No tone dialling

| Check that the DTMF signal is being output from pin 3 of IC5 on the digital board. | NO → | Check IC5 and pin 70~81 of IC1 on the digital board. |

YES ↓

Check that the DTMF signal is being output at the points on the DTMF circuit send route.

2.3.4.5. Power Supply Board Section

1. **Key components for troubleshooting**

Check the following parts first: F101, D101-D104, C106, Q101, PC101 and IC101.

This comes from our experience with experimental tests.
For example: power supply and lightning surge voltage test, with standing voltage test, intentional short circuit test, etc.

Caution:

If you find a melted fuse in the unit, do not turn on the power until you locate and repair the faulty parts (except for the fuse); otherwise the fuse will melt again and you cannot pinpoint the faulty point.

In most cases, the symptom is that nothing is output. It is more likely that the fault is in the primary side rather than the secondary side. Check the primary side first.

POWER SUPPLY BLOCK DIAGRAM

DUMMY LOAD to check voltage

When you check voltage in a power supply unit alone, use this dummy load. If the dummy load is not available, connect the main P.C.B. to the analog P.C.B.

Ⓥ : Volt Meter
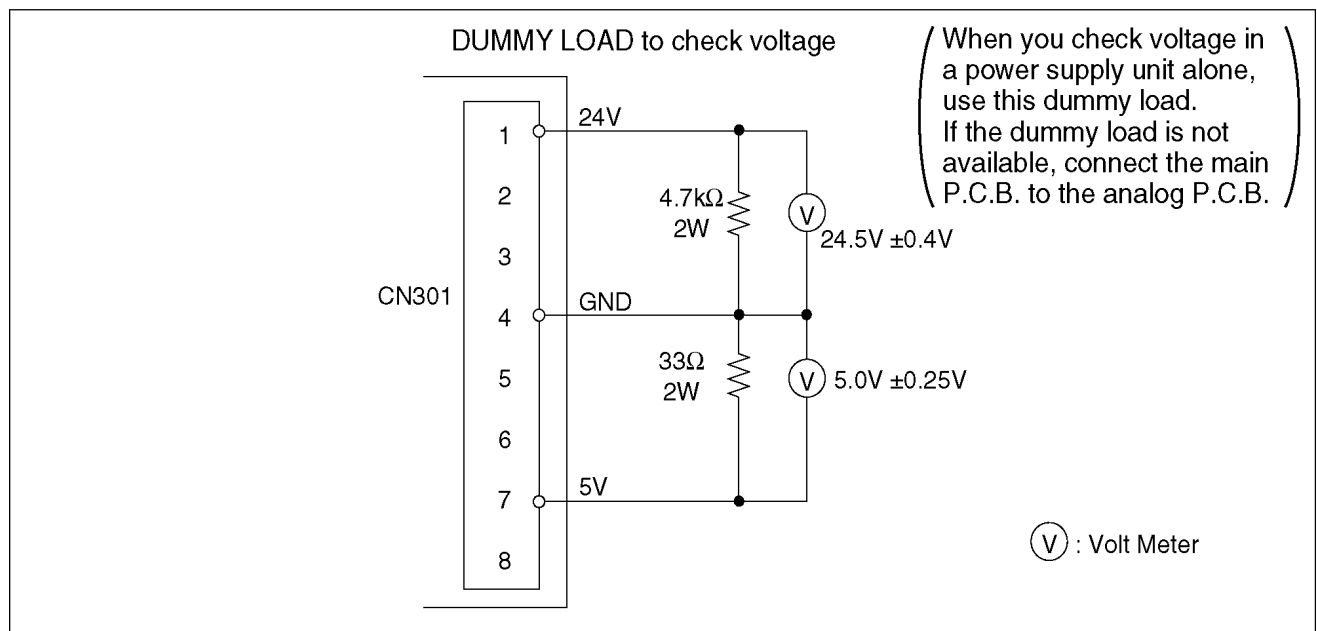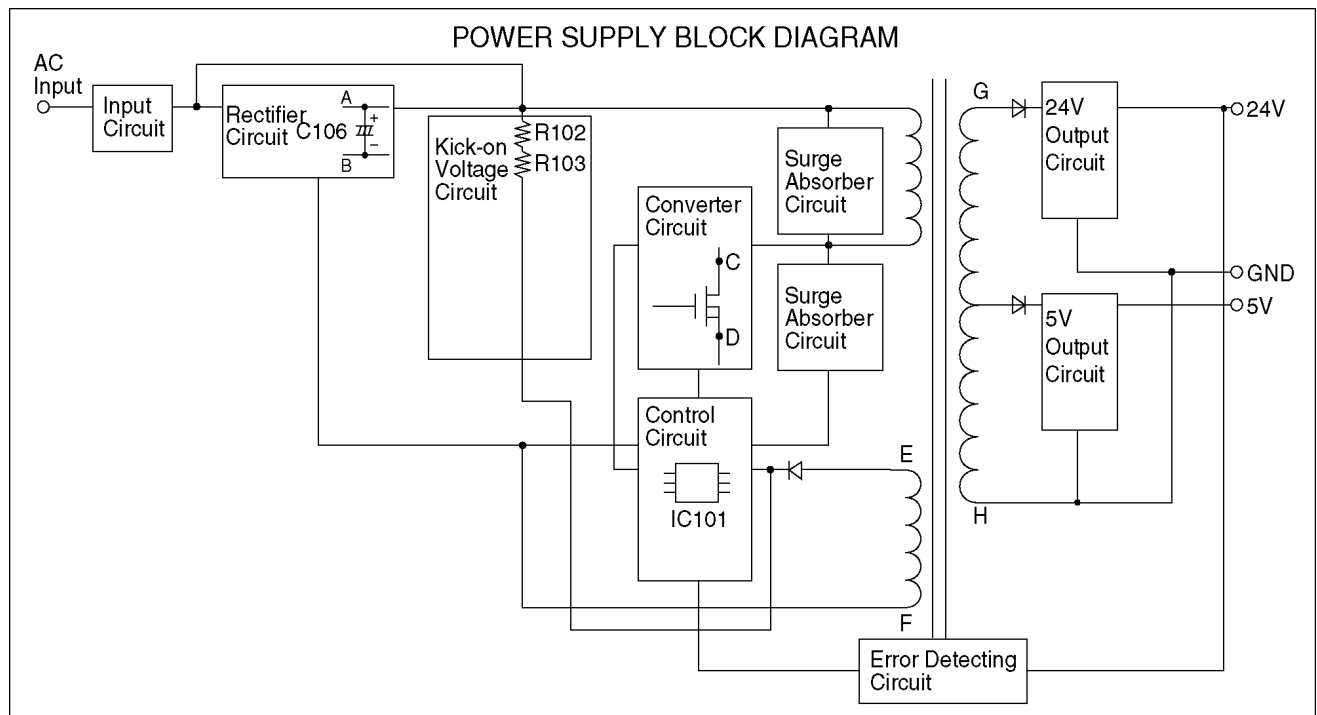
2. Troubleshooting Flow Chart

```
                    ┌─────────────────┐  NO
                    │   Is F101 open? │──────┐
                    └─────────────────┘      │
                         │ YES               │
                    ┌─────────────┐          │
                    │ Replace F101.│         │
                    └─────────────┘          │
                         │                   │
              ┌─────────────────────┐  NO    │
              │  Is D101-D104 short?│────┐    │
              └─────────────────────┘    │    │
                     │ YES               │    │
              ┌─────────────────┐        │    │
              │ Replace D101-D104.│      │    │
              └─────────────────┘        │    │
                     │ ◄─────────────────┴────┘
              ┌──────────────────────┐  NO
              │  Are D-G, D-S, and   │──────┐
              │  S-G (Q101) short?   │      │
              └──────────────────────┘      │
                     │ YES                  │
              ┌────────────────────┐        │
              │ Replace Q101 and R105.│     │
              └────────────────────┘        │
                     │ ◄────────────────────┘
              ┌──────────────┐
              │  Power ON    │
              └──────────────┘
```
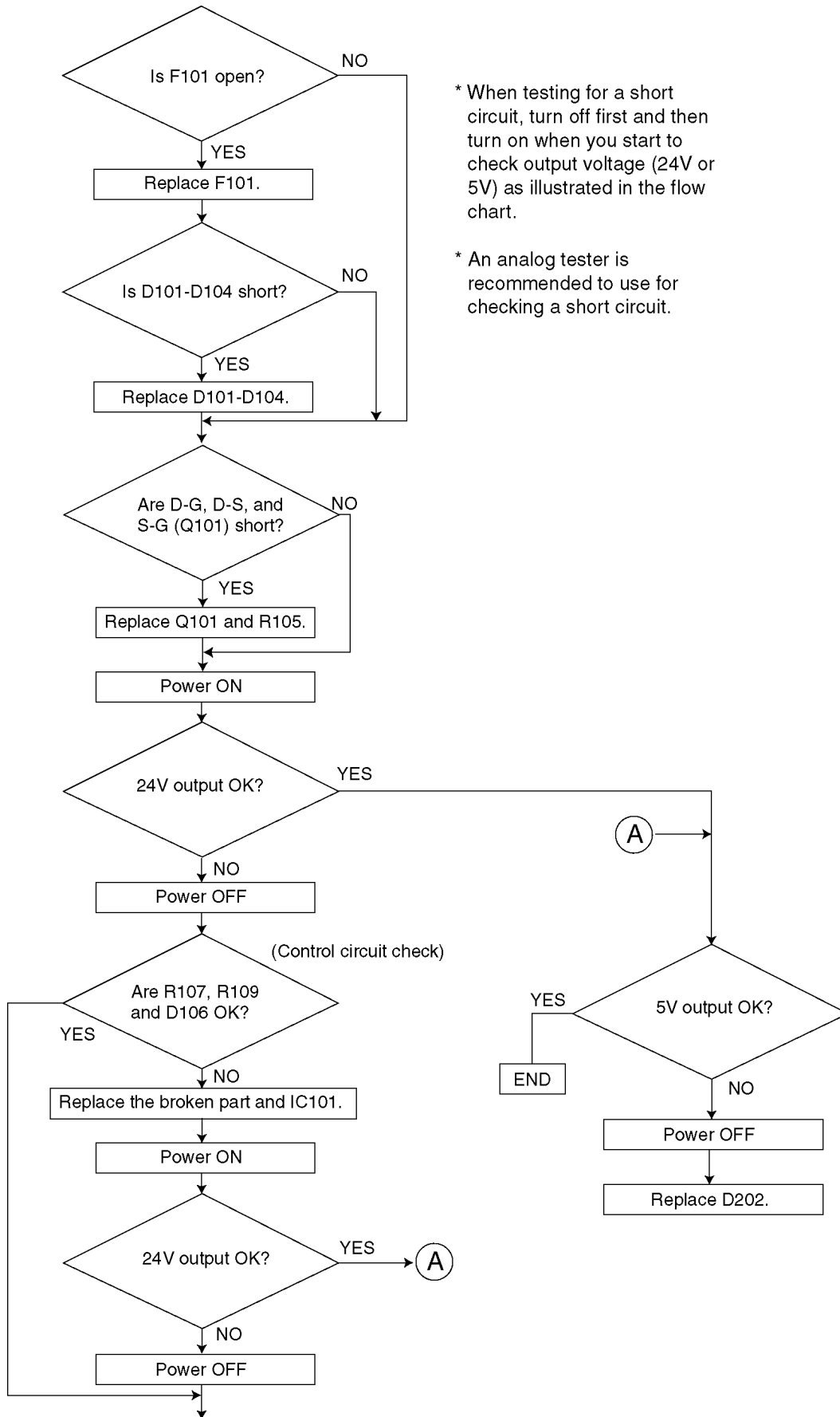
* When testing for a short circuit, turn off first and then turn on when you start to check output voltage (24V or 5V) as illustrated in the flow chart.

* An analog tester is recommended to use for checking a short circuit.

```
              ┌──────────────┐  YES                           ┌───┐
              │ 24V output OK?│──────────────────────────────►│ A │───►
              └──────────────┘                                └───┘
                     │ NO
              ┌──────────────┐
              │  Power OFF   │
              └──────────────┘
                     │        (Control circuit check)
              ┌──────────────────┐
         ┌───►│ Are R107, R109   │  YES
         │    │ and D106 OK?     │──────┐
         │    └──────────────────┘      │
         │           │ NO               │
         │    ┌────────────────────────────┐
         │    │ Replace the broken part and IC101.│
         │    └────────────────────────────┘
         │           │
         │    ┌──────────────┐
         │    │  Power ON    │
         │    └──────────────┘
         │           │
         │    ┌──────────────┐  YES     ┌───┐
         │    │ 24V output OK?│────────►│ A │
         │    └──────────────┘          └───┘
         │           │ NO
         │    ┌──────────────┐
         └────│  Power OFF   │
              └──────────────┘


                                    ┌──────────────┐  YES
                                    │ 5V output OK?│──────┐
                                    └──────────────┘      │
                                         │ NO        ┌───────┐
                                    ┌──────────────┐ │  END  │
                                    │  Power OFF   │ └───────┘
                                    └──────────────┘
                                         │
                                    ┌──────────────┐
                                    │ Replace D202.│
                                    └──────────────┘
```

(Control circuit check)

Is R102, R103, R104 or R105 short or open? — NO

YES

Replace the broken part.

24V output OK? — YES → (A)

NO

Does D201, IC201, PC101 or R222 short? — NO

YES

Replace the broken part.

24V output OK? — YES → (A)

NO

Is R221, R222, VR201, R224 or R225 short or open? — NO

YES

Replace the broken part.

24V output OK? — YES → (A)

NO

(Control circuit check)

Are R108, D108, R125 and D107 OK? — YES

NO

Replace the broken part and IC101.

Power ON

24V output OK? — YES — (A)

NO

Power OFF

NO — Are D201, IC201, PC101 and R222 OK?

YES

Replace the broken part.

Power ON

24V output OK? — YES — (A)

NO

Power OFF

Replace the whole board.

3. **Broken parts repair details**

(D101, D102, D103, D104)

Check for a short-circuit in terminal 4. If D101, D102, D103 and D104 are short-circuited, F101 will melt (open).

In this case, replace all of the parts (D101, D102, D103, D104, F101).

(Q101)

The worst case of Q101 is a short-circuit between the Drain and Gate because damage expands to the peripheral circuit of Q101.

This is due to a very high voltage through the Gate circuit which is composed of R107, R109, D106 and IC101.

You should change all of the parts listed as follows.

F101, Q101, R107, R109, D106, IC101

(D201)

If D201 is broken, the oscillation circuit in the power supply cannot operate. Check it with an electric tester.

2.3.4.6. Operation Board Section

1. **No key operation**

```
Do the keys remain pressed       YES
even when you do noting?    ─────────────►   Repair the keys.
Perform a KEY CHECK (Refer to
2.5. TEST FUNCTION.)

Keys occasionally    NO        OK
don't work.         │        ───────────►  END
                    ▼
Check if CN6 and CN7
(digital board) or CN1 and CN2  ──────────►  Check IC1.
(operation board) is disconnected.           (operation board)

                    NG
                    │
                    ▼
Repair CN6 and CN7.
```

2. **No LCD indication**

```
Perform an LCD check (refer to      OK
2.5. TEST FUNCTION.) to        ───────────►  END
determine if the LCD is operating
correctly.

                    NG
                    │
                    ▼
Is the cable and connector between  NO
the LCD and operation board    ───────────►  Repair.
disconnected?

                    YES
                    │
                    ▼
Replace the LCD.

                    NG
                    │
                    ▼
Check if CN6 and CN7
(digital board) or CN1 and CN2
(operation board) is disconnected.
```

2.3.4.7.   Sensor Section

Refer to **6.5. SENSORS AND SWITCHES** for the circuit descriptions.

1. **Check the document sensor (PS1)................"REMOVE DOCUMENT"**

| Check the voltage at pin 3 of CN2. Document set 4~5V No document 0V — When the pin 3 of CN1 and pin 8 of IC1 is low level. | → NG | Check the soldering at R12. | → OK | Check the soldering at Q1, Q3, D1, R11. |

OK ↓

Check if CN6 and CN7 (digital board) or CN1 and CN2 (operation board) is disconnected.

OK ↓

Replace PS1.

2. **Check the read position (PS2)................"CHECK DOCUMENT"**

Check the voltage at pin 3 of CN2.
Document set 0V
No document 4~5V — When the pin 2 of CN1 and pin 8 of CN1 is low level.

→ NG

Check the soldering at R12.

→ OK

Check the soldering at Q2, Q3, D1, R11.

OK ↓

Check if CN6 and CN7 (digital board) or CN1 and CN2 (operation board) is disconnected.

OK ↓

Replace PS2.
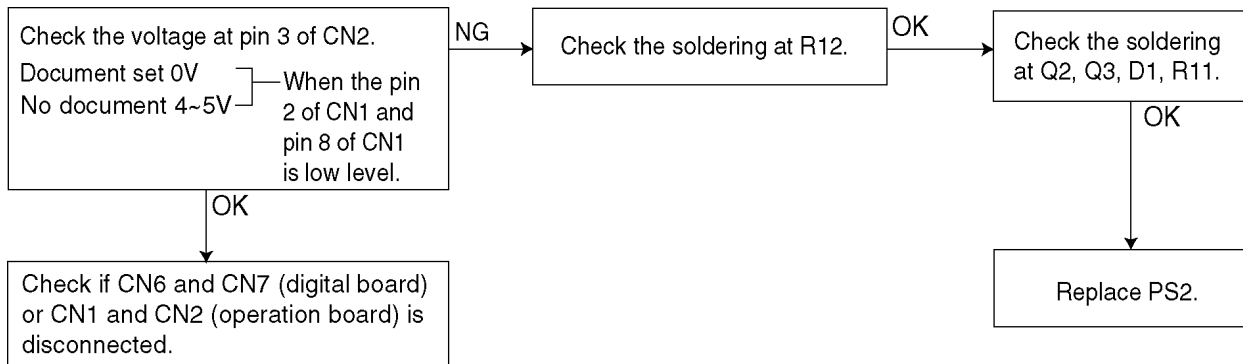
2.3.4.8. Read Section

Refer to **6.4.4. SCANNING BLOCK**.

```
┌─────────────────────────────────┐   NG   ┌──────────────────────────────┐
│ Are the glass surface of the    │───────→│ Clean the location in        │
│ contact image sensor (CIS) and  │        │ question.                    │
│ the white panel on the back of  │        └──────────────────────────────┘
│ the operation block clean?      │
└─────────────────────────────────┘
             │ OK
             ▼
┌─────────────────────────────────┐
│ Conduct a scanner test in       │
│ service mode "555".             │
└─────────────────────────────────┘
             │
             ▼
┌──────────────────┐  NO  ┌──────────────────────┐  NO  ┌──────────────────────┐
│ Is the LED array │─────→│ Is pin 10 of CN8 on  │─────→│ Check the 24V line of│
│ lit?             │      │ the digital board at │      │ the power supply.    │
└──────────────────┘      │ 23 to 24V?           │      └──────────────────────┘
        │ YES             └──────────────────────┘
        │                      │ YES
        │                      └──→ (A) (Next page)
        ▼
┌──────────────────────────────┐  NO  ┌──────────────────────┐
│ Is pin 3 of CN8 on the       │─────→│ Check R82, J2.       │
│ digital board at 4 to 5V ?   │      └──────────────────────┘
└──────────────────────────────┘
             │ YES
             ▼
            (B)
         (Next page)
```

(A)

Is pin 154 of IC1 on the digital board at 3.3V? ── NO ──▶ Check IC1 on the digital board.

│ YES

Check IC7 on the digital board.

(B)

Observe the waveform at test point TP12 on the digital board with an oscilloscope (while scanning the white panel). ── NO ──▶ Check the image sensor.

│ YES

Apply a trigger at the rising edge of CH2 given the following settings :
    CH1   0.2V/div connect to VIDEO.
    CH2   5V/div connect to FIG.
    Time   1ms/div

0.2V   0.8V

2.3.4.9. Thermal Head Section

Refer to **6.4.3. THERMAL HEAD**.

During copying, is the base of Q8 on the digital board at 4 to 5V ?
→ NO → Check pin 170 of IC1 on the digital board.
→ NG → Make the necessary repairs.

↓ YES

Check pin 170 of IC1 on the digital board.
→ OK

During copying, are pins 1 to 3 of Q13 on the digital board at 23 to 25V ?
→ NO → Is pin 1 of CN1 on the digital board at 23 to 25V?
→ NO → Check the power supply.

↓ YES

↓ YES

During copying, is pin 5 of Q13 on the digital board at 23 to 25V ?

Check the route between pin 1 of CN1 and pin 1 of Q13 on the digital board.

Check the voltage at pin 207 of IC4 on the digital board. (Refer to **6.3.7. Supervision Circuit for the Thermal Head Temperature.**)

YES | NO

NO → Replace Q13.

↓ YES

Check the solder points of pin 159, 160, 163, 166, 167 of IC1 on the digital board.
→ NG → Make the necessary repairs.

↓ OK

Check the waveform of CN4 on the digital board. (Refer to **6.4.3. Thermal Head**.)

2.4. PROGRAMMING AND LISTS

The programming functions are used to program the various features and functions of the machine, and to test the machine. Programming can be done in both the on-hook and off-hook conditions. This facilitates communication between the user and the service while programming the machine.

2.4.1. OPERATION

There are 2 basic categories of programming functions, the User Mode and the Service Mode. The Service Mode is further broken down into the normal and special programs. The normal programs are those listed in the Operating Instructions and are available to the user. The special programs are only those listed here and not displayed to the user. In both the User and Service Modes, there are Set Functions and Test Functions. The Set Functions are used to program various features and functions, and the Test Functions are used to test the various functions.

The Set Functions are accessed by entering their code, changing the appropriate value, then pressing the SET key.

The Test Functions are accessed by entering their code and pressing the key listed on the menu. While programming, to cancel any entry, press the STOP key.

2.4.2. OPERATION FLOW
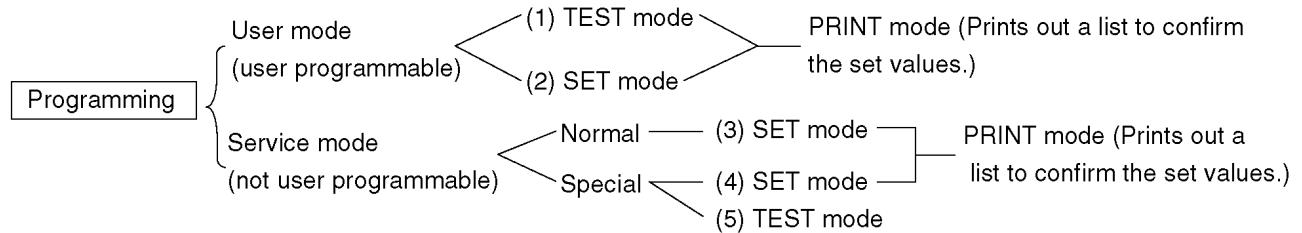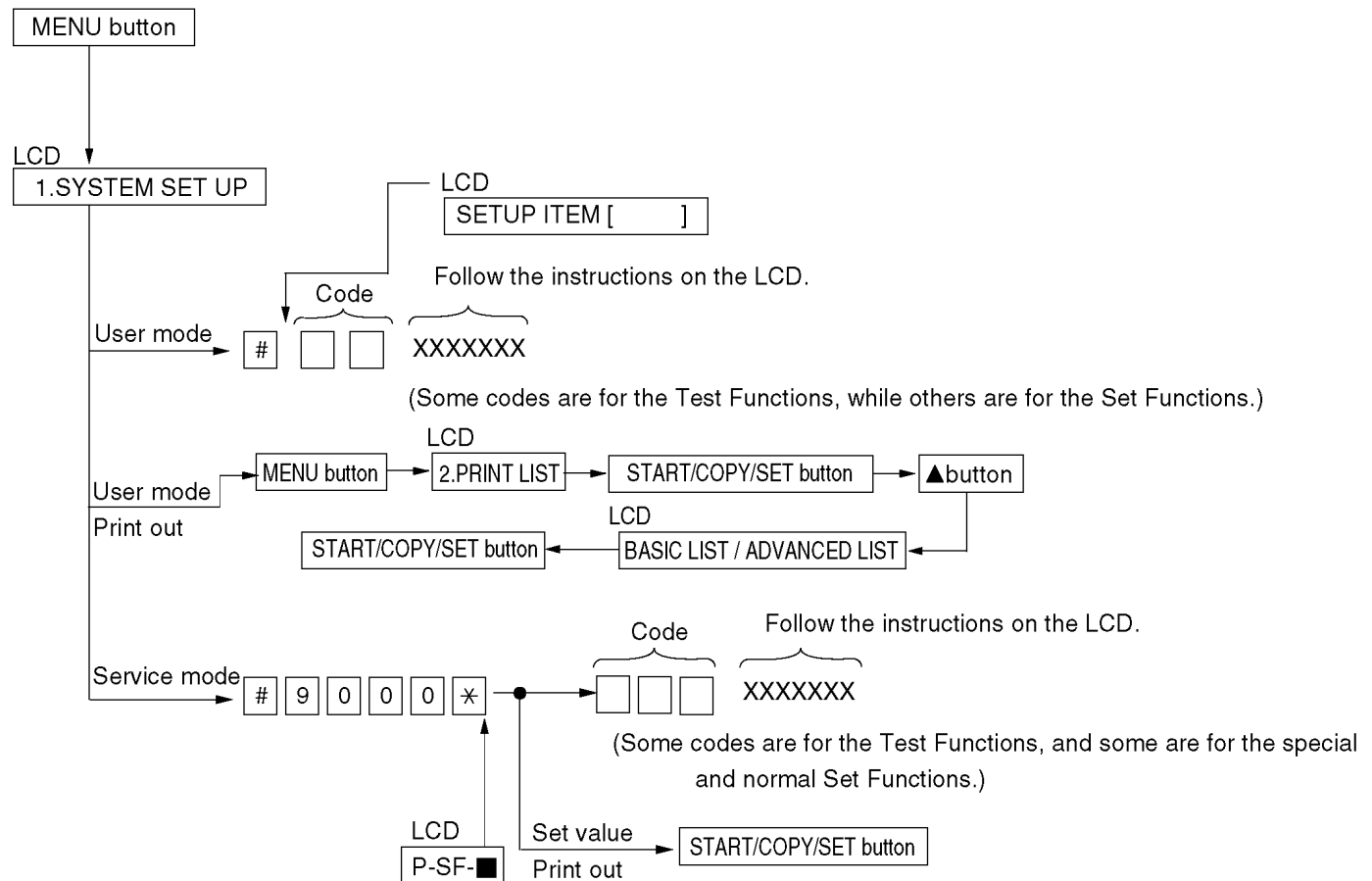
2.4.3. USER MODE (The list below is an example of the SYSTEM SETUP LIST the unit prints out.)

【 BASIC FEATURES 】

NO.	FEATURE	CURRENT SETTING	
#01	SET DATE & TIME	ЯHB. 01 1999 00:00	
#02	YOUR LOGO		
#03	YOUR FAX NUMBER		
#04	PRINT SENDING REPORT	ERROR	[ERROR,ON,OFF]
#07	FAX RING COUNT	1	[1...4]
#13	DIALING MODE	TONE	[TONE,PULSE]

Code → Set Value

【 ADVANCED FEATURES 】

NO.	FEATURE	CURRENT SETTING	
#22	JOURNAL AUTO PRINT	ON	[ON,OFF]
#23	OVERSEAS MODE	OFF	[ON,OFF]
#25	DELAYED SEND	OFF	[ON,OFF]
	DESTINATION =		
	START TIME = 00:00		
#30	SILENT FAX RECOGNITION RING	3	[3...9]
#31	RING DETECTION	OFF	[A,B,C,D,OFF]
#41	FAX ACTIVATION CODE	ON	[ON,OFF]
	CODE = *9		
#46	FRIENDLY RECEPTION	ON	[ON,OFF]
#49	AUTO DISCONNECT	ON	[ON,OFF]
	CODE = *0		
#58	ORIGINAL SETTING	NORMAL	[NORMAL,LIGHT,DARKER]
#70	FAX PAGER CALL	OFF	[ON,OFF]
	DESTINATION =		
#76	CONNECTING TONE	ON	[ON,OFF]
#77	AUTO ANSWER MODE	FAX ONLY	[FAX ONLY,TEL/FAX]
#78	TEL/FAX DELAYED RING	1	[1...4]
#80	SET DEFAULT		

Code → Set Value

Note:

The above values are the default values.

2.4.4. SERVICE FUNCTION TABLE

Code	Function	Set Value	Effective Range	Default	Remarks
501	Setting the pause time	001~600 × 100 msec	001~600	05000 msec	Selects the pause time in 100 msec steps.
502	Setting the flash recall time	01~99 × 10 msec	01~99	700 msec	Selects the line break time during flashing in 10 msec steps.
503	Setting the pulse dial speed	1:10pps 2:20pps	1, 2	10 pps	Sets the pulse dial speed.
520	Setting the CED frequency	1:2100Hz 2:1100Hz	1, 2	2100 Hz	When international communications cannot be performed smoothly, select 1100 Hz.
521	Setting the international line mode	1:ON 2:OFF	1, 2	ON	Selects the international line mode during FAX communication.
522	Setting the return to default mode	1:ON 2:OFF	1, 2	ON	Sets the resolution and contrast conditions for FAX or copy to the default settings.
523	Setting the reception equalizer	1:ON 2:OFF	1, 2	OFF	When the telephone station is far from the unit or sending cannot be performed correctly, set to "ON".
524	Setting the sending equalizer	1:ON 2:OFF	1, 2	OFF	When the telephone station is far from the unit or sending cannot be performed correctly, set to "ON".
544	Selecting the document feed position	01~99 step	00~99	-----	When the ADF function is incorrect, adjust the feed position. (8 step = 1mm)
550	Memory clear				Press "START/COPY/SET".
551	ROM version and sum check				Press "START/COPY/SET".
553	Setting the FAX monitor function	1:OFF 2:PHASE B 3:ALL	1, 2, 3	OFF	Sets whether to monitor the line signal with the unit´s speaker during FAX communication or not.
554	Modem test				Press "START".
555	Scanner test				Press "START".
556	Motor test				Press "START".
557	LED test				Press "START".
558	LCD test				Press "START".
559	Setting the document jam detection	1:ON 2:OFF	1, 2	ON	See **2.2. USER RECOVERABLE ERRORS**.
561	KEY test				Press any key.
563	CCD position adjustment value set	01~30 × 1 mm	00~30	-----	Lets you select the correction value for the scanner to align the image.
570	Setting the % break	1:61% 2:67%	1, 2	61%	Sets the % break of pulse dialing.
571	Setting the number of times that ITS is redialed	00~99	00~99	14 times	Selects the number of times that ITS is redialed (not including the first dial).
572	Setting the ITS redial interval	001~999 sec	001~999	030 sec	Sets the interval of ITS redialing.
573	Setting of number of time that REMOTE TURN ON BELL sound	01~99	01~99	15 times	Sets the number of times that the unit starts to receive a document in the TEL mode.
590	Setting the number of FAX redial times	00~99	00~99	5 times	Selects the number of redial times during FAX communication (not including the first dial).
591	Setting the FAX redial interval	001~999 sec	001~999	045 sec	Sets the FAX redial interval during FAX communication.
592	Designation of CNG sending	1:OFF 2:ALL 3:AUTO	1, 2, 3	ALL	Lets you select the CNG output during FAX transmission. ALL: CNG is output at phase A. AUTO: CNG is output only when automatic dialing is performed. OFF: CNG is not output at phase A.
593	Setting the interval between CED and the 300 bps signal	1:75 msec 2:500 msec 3:1000 msec	1, 2, 3	75 msec	Sets the interval between the CED signal and subsequent 300 bps signal.
594	Setting the overseas DIS detection	1: Detects on the 1st time. 2: Detects on the 2nd time.	1, 2	Detects on the1st time.	Sets the recognition format of the DIS signal. 1:Detects the first DIS signal sent from the receiver during FAX transmission. 2:Ignores the first DIS signal sent from the receiver during FAX transmission.
595	Setting an acceptable reception error value	001~999 × number of times	001~999	100	Sets the number of acceptable error lines when the FAX reconstructs the received data.
596	Setting the transmit level	- 15~00	- 15~00	- 10 dBm	Selects the FAX transmission level. (Increase the level when the telephone line condition is poor.)
598	Modem sensitivity		20~48	45	See **2.3.4.2.1. Defective facsimile section**.
717	Transmit speed select	1:9600BPS 2:7200BPS 3:4800BPS 4:2400BPS	1~4	9600 BPS	Adjusts the speed to start training during FAX transmission.

Code	Function	Set Value	Effective Range	Default	Remarks
718	Receive speed select	1:9600BPS 2:7200BPS 3:4800BPS 4:2400BPS	1~4	9600 BPS	Adjusts the speed to start training during FAX reception.
719	Ringer off in TEL/FAX mode	1:ON 2:OFF	1, 2	ON	Sets the ringer switch off when a call is received in the TEL/FAX mode.
721	Pause tone detect	1:ON 2:OFF	1, 2	ON	Selects the tone detection for pauses in dialing.
722	Redial tone detect	1:ON 2:OFF	1, 2	ON	Selects the tone detection mode after redialing.
763	CNG detect time	1:10 sec 2:20 sec 3:30 sec	1, 2, 3	20 sec	Selects the CNG detection time of friendly reception.
771	T1 timer	1:35 sec 2:60 sec	1, 2	35 sec	Sets a higher value when the response from the other party needs more time during FAX transmission.
774	T4 timer	00~99 (×100ms)	00~99	00	
815	Sensor check				Press "START".
882	Journal 3 list				See **2.6.1. PRINTOUT EXAMPLE**.
844	Original setting	1:NORMAL 2:LIGHT 3:DARKER	1, 2, 3	NORMAL	Use this feature when you need to transmit and copy a document with very faint writing or very dark writing.

2.4.5.   SERVICE MODE SETTINGS (Example of a printed out list)

```
【 SERVICE DATA LIST 】

        501 PAUSE TIME          =   050*100ms        [001...600]*100ms
        502 FLASH TIME          =   70*10ms          [01...99]*10ms
        503 DIAL SPEED          =   10pps            [1=10     2=20]pps
        520 CED FREQ.           =   2100Hz           [1=2100   2=1100]Hz
        521 INTL. MODE          =   ON               [1=ON     2=OFF]
        522 AUTO STANDBY        =   ON               [1=ON     2=OFF]
        523 RCV EQL.            =   OFF              [1=ON     2=OFF]
Code    524 SND EQL.            =   OFF              [1=ON     2=OFF]

                                                  Set Value

        【 SPECIAL SERVICE SETTINGS 】
Code
        544    553    559    570    571    572    573    590    591    592    593    594    595
         50      1      1      1     14    030     15     05    045      2      1      1    100
Set Value
        596    598    717    718    719    721    722    763    771    774    844
         10     45      1      1      1      1      1      2      1     00      1
```

Note:

   The above values are the default values.

```
【 HISTORY 】

1.DATE


  TIME=00002 HOURS
2.KEY OPERATION
  1ST. 50:
  01 05 05 3C 39 3A 3A 3A 3B 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  LAST 50:
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
3.NUMBER OF COPY
  =00000
4.NUMBER OF RX
  =00000
5.NUMBER OF TX
  =00000


YOUR LOGO
YOUR FAX NUMBER
```

2.4.6. OTHER

[HISTORY]

No.	Display	Function
1	DATE	Date and time which are set by a user for the first time after purchase. TIME is the expiration from the first power on after purchase.
2	KEY OPERATION	Indicate 2-digit codes. (Refer to **2.5.2. Button Code Table**). 1st.50: History of the key operation from 1st to 50th after purchase. Last.50: History of the last 50 key operations.
3	NUMBER of COPY	The number of pages copied.
4	NUMBER of RX	The number of pages received.
5	NUMBER of TX	The number of pages sent.

2.5.　TEST FUNCTIONS

Test mode	Type of Mode	Code ☐☐ / Operation after code input.	Function
PRINT TEST	User mode	8 5 START	Prints a test pattern and checks the thermal head for abnormalities (missing dots, etc.), and also checks the operation of the reception motor. (Refer to **2.5.3. Print Test Pattern.**)
MOTOR TEST	Service Mode	5 5 6 START	Rotates the transmission and reception motors to check the operation of the motors. 0.....Stop 1.....Turn forward TX roller at 400pps 2-2 phase 2.....Turn forward TX roller at 400pps 1-2 phase 3.....Turn forward RX roller at 400pps 2-2 phase 4.....Turn forward RX roller at 400pps 1-2 phase 5.....Turn forward TX/RX roller at 400pps 1-2 phase 6.....Reverse the motor at 400pps 1-2 phase 7.....Set the cam gear to the home position 8.....Set the cam gear to the RX mode 9.....Set the cam gear to the copy mode 　Press the STOP button to cancel.
MODEM TEST	Service Mode	5 5 4 START	Sends four kinds of FAX signals to check the sending function of the modem. 1) 1100 Hz: Consecutive signal of EOM for tonal 2) 2100 Hz: G2 carrier signal 　　　　　　　Consecutive of CED signal 3) G3, V29 training signal [modulation wave of carrier signal (1700 Hz)]
ROM CHECK	Service Mode	5 5 1 START	Indicates the version and checks the sum of the ROM.
SCAN CHECK	Service Mode	5 5 5 START	Turns on the LEDs of the image sensor and operates the read systems.
LCD CHECK	Service Mode	5 5 8 START	Checks the LCD indication. Illuminates all the dots to check if they are normal.
DTMF SINGLE TEST	Service Mode	5 5 2 1..On 2..Off	Outputs the DTMF with a single tone.
KEY CHECK	Service Mode	5 6 1 START { any key	Checks the operation button. Indicates the button code on the LCD while the button is pressed. Refer to **2.5.2. Button Code Table.**
FACTORY SET	Service Mode	5 5 0 START	Clears the memory where the users can store data.
SENSOR CHECK	Service Mode	8 1 5 START	CHECKS THE SENSOR OPERATION After entering this mode, perform the copy operation. Do Sn Pa : LCD DISPLAY Do : Document Sensor : Paper inserted. Turns on when a document is inserted. Sn : Read Position Sensor : At the read Position. Turns on when the front cover is opened and the sensor lever is pressed directly. Pa : Recording Paper Sensor : Set Recording Paper. Turns on and off when the cassette lock lever is pushed down and up.

2.5.1. DTMF SIGNAL TONE TRANSMIT SELECTION

When set to ON (=1), the 12 keys and transmission frequencies are as shown.

key	High Frequency (Hz)	Key	Low Frequency (Hz)
"1"	697	"5"	1209
"2"	770	"6"	1336
"3"	852	"7"	1477
"4"	941	"8"	1633

When set to OFF (=2), the 12 keys and transmission frequencies are as shown.

High (Hz) / Low (Hz)	1209	1336	1477
697	"1"	"2"	"3"
770	"4"	"5"	"6"
852	"7"	"8"	"9"
941	✳	"0"	"#"

Note:

After performing this check, do not forget to turn the setting off.

Otherwise, dialing using DTMF will not be possible.

2.5.2. BUTTON CODE TABLE

Code	Button Name	Code	Button Name	Code	Button Name
02	RESOLUTION	31	1	87	STATION 1
03	MODE RECEIVE	32	2	88	STATION 2
04	START/COPY/SET	33	3	89	STATION 3
05	MENU	34	4	3A	0
07	HELP	35	5	3B	✳
08	MONITOR	36	6	3C	#
0B	LOWER	37	7	3D	REDIAL/PAUSE
0C	DIRECTORY	38	8	3E	FLASH
0D	∧ VOLUME	39	9	00	NO INPUT
0E	∨ VOLUME			01	STOP

Note:

These codes (00, 01) are only for the data in the History Report.

2.5.3. PRINT TEST PATTERN
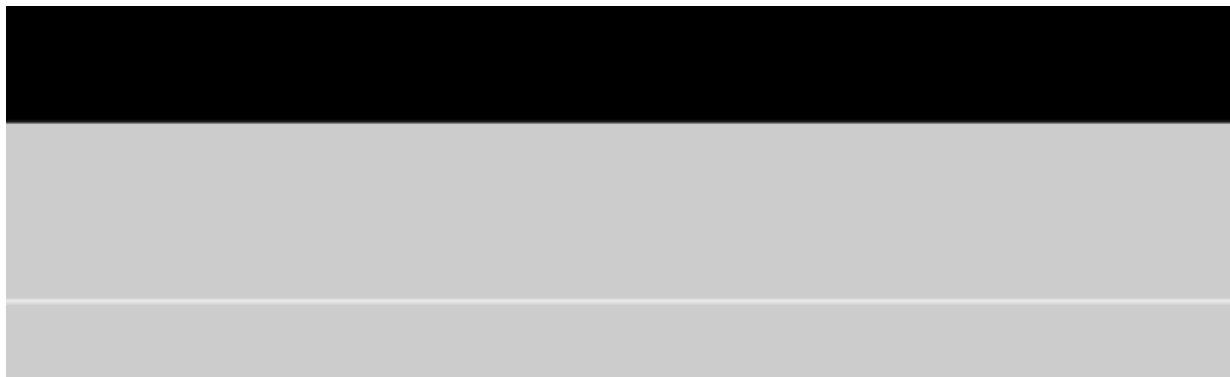
2.6. JOURNAL 3

Descriptions:

1. **ENCODE**

   Compression Code: MH/MR

2. **MSLT**

   MSLT means Minimum Scan Line Time. Used only at the factory.

3. **RESOLUTION**

   Indicates the resolution of the communication. If multiple pages are transmitted or received, it indicates the last page´s resolution. If there is a communication error, "?" is displayed.

4. **RCV-TRIG. (CNT.)**

   Indicates the trigger that causes the unit to switch to the fax receive mode. The available options are listed in JOURNAL 2 in **2.6.1. PRINTOUT EXAMPLE**. The values in parentheses indicate how many times the trigger has been used. (For example, "0003" means three times.)

No.	Display	Function
1	FAX MODE	Means the unit received a fax message in the FAX mode.
2	MAN RCV	Means the unit received a fax message by manual operation.
3	FRN RCV	Means the unit received a fax message by friendly signal detection.
4	RMT DTMF	Means the unit detected DTMF (Remote Fax activation code) entered remotely.
5	PAL DTMF	Means the unit detected DTMF (Remote Fax activation code) entered by a parallel connected telephone.
6	TURN-ON	Means the unit started to receive after 15 rings. (Remote Turn On: Service Code #573)
7	TIME OUT	Means the unit started to receive after Ring Time Out in the EXT-TAM or TEL/FAX mode.
8	IDENT	Means the unit detected Ring Detection.
9	TEL/FAX	Means the unit detected the CNN while it was sending the Dummy Ring Back Tone in the TEL/FAX mode.

5. **ERROR→MEMORY**

   Indicates the reason why the unit received a fax message in memory.
   If you look at No.11 in the JOURNAL 2 in **2.6.1. PRINTOUT EXAMPLE**, it shows the fax message was received in memory due to "PAPER OUT" error.

    NO RESPONSE DISAPPEARED ON JOURNAL

   The "**NO RESPONSE DISAPPEARED ON JOURNAL**" displays the information about the last 10 communications terminated by "No Response". (Some of the communications terminated by "No Response" were not displayed in the JOURNAL.)When a fax transmission cannot be performed because the other party´s unit is set to the TEL mode, "No response" will be printed.

6. **EQM**

   EQM means Eye Quality Monitor. Used only at the factory.

7. **ERROR LINE(RX)**

   When an error occurs while receiving a fax, this shows the number of error lines.

8. **MAKER CODE**

   This shows a 2 digit code of the other partyís fax machine brand.

   0E: "KX" model
   00: Unknown
   79: "UF" model
   19: "Zerox" model

2.6.1. PRINTOUT EXAMPLE

【 JOURNAL3 】

02 ENE. 1999 08:49PM

NO.	ENCODE	MSLT	RESOL	SPEED	RCV-TRIG.	EQM(RX)	ERROR LINE(RX)	MAKER CODE
01	MR	20msec	STD.	9600BPS	FAX MOD	003B50	00000	0E
02	MR	20msec	STD.	9600BPS	FAX MOD	003A65	00000	0E
03	MR	20msec	STD.	9600BPS	FAX MOD	0088D1	00000	0E
04	MR	20msec	STD.	9600BPS	FAX MOD	002A5C	00000	0E
05	MR	20msec	STD.	9600BPS	FAX MOD	003CB0	00000	0E
06	MR	20msec	STD.	9600BPS	FAX MOD	0029B0	00000	0E
07	MR	20msec	STD.	9600BPS	FAX MOD	00614D	00000	0E
08	MR	20msec	STD.	9600BPS	FAX MOD	0032DD	00001	0E
09	MR	20msec	STD.	9600BPS	FAX MOD	002CAF	00000	0E
10	MR	20msec	STD.	9600BPS	FAX MOD	00311C	00000	0E
11	MR	20msec	STD.	9600BPS	FAX MOD	0037BD	00000	0E
12	MR	20msec	STD.	9600BPS	FAX MOD	003744	00000	0E
13	MR	20msec	STD.	9600BPS	FAX MOD	0044B1	00000	0E
14	MR	20msec	STD.	9600BPS	FAX MOD	0028F2	00000	0E
15	MR	20msec	STD.	9600BPS	FAX MOD	0028E2	00000	0E
16	MR	20msec	STD.	9600BPS	FAX MOD	0038A0	00000	0E
17	MR	20msec	STD.	9600BPS	FAX MOD	0037A0	00000	0E
18	MR	20msec	STD.	9600BPS	FAX MOD	00317A	00000	0E
19	MR	20msec	STD.	9600BPS	FAX MOD	003B01	00000	0E
20	MR	20msec	STD.	9600BPS	FAX MOD	003D35	00000	0E
21	MR	20msec	STD.	9600BPS	FAX MOD	003326	00000	0E
22	MR	20msec	STD.	9600BPS	FAX MOD	0035CC	00000	0E
23	MR	20msec	STD.	9600BPS	FAX MOD	0035B8	00000	0E
24	MR	20msec	STD.	9600BPS	FAX MOD	003781	00000	0E
25	MR	20msec	STD.	9600BPS	FAX MOD	003403	00000	0E
26	MR	20msec	STD.	9600BPS	FAX MOD	0076F9	00000	0E
27	MR	20msec	STD.	9600BPS	FAX MOD	0032EB	00000	0E
28	MR	20msec	STD.	9600BPS	FAX MOD	0032EB	00000	00
29	MR	20msec	STD.	9600BPS	FRN RCV	003218	00000	0E
30	MR	20msec	STD.	9600BPS	MAN RCV	003FDD	00000	0E
31	MR	20msec	STD.	9600BPS	TEL/FAX	0037AF	00000	0E
32	MR	10msec	S-FINE	9600BPS	PAL DTMF	0041E0	00000	0E
33	MR	20msec	STD.	9600BPS	TURN-ON	00432E	00000	0E
34	MR	20msec	STD.	9600BPS	TEL/FAX	0037FE	00000	0E
35	MR	20msec	STD.	9600BPS	IDENT	006373	00000	0E

3 ADJUSTMENTS

3.1. ADJUSTING THE FEED PRESSURE

If no feeding or multiple feeding occurs frequently, adjust the feeder pressure.

1. Open the front lid by pressing the front lid open.

2. Shift the position of the lever using an instrument with a pointed end, such as paper clip.

   Right: When documents do not feed.

   Center: Standard position (pre-selected)

   Left: When documents multiple feed.

3. Close the front lid by gently pressing down on both ends.
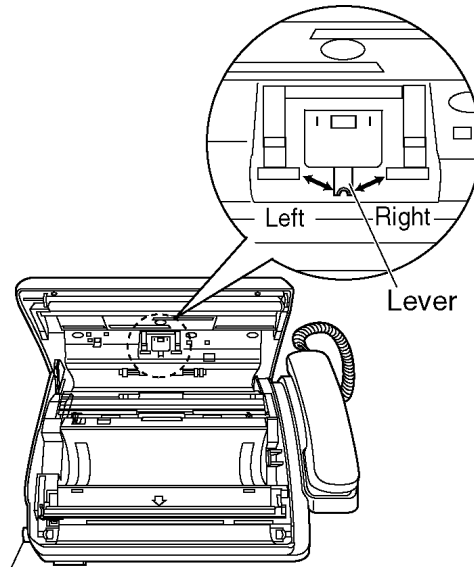
Note:

Touch the lever using an instrument with a pointed end such as ball-point pen because the lever is located in a small place.

4 DISASSEMBLY INSTRUCTIONS

Ref. No. 1	HOW TO REMOVE THE HANDSET CRADLE CABINET
Procedure 1	1) Push the front lid open button. 2) Push the tabs with a screwdriver. (See Fig.A.) 3) Remove the handset cradle cabinet.

Fig. A

HANDSET CRADLE CABINET

VIEW
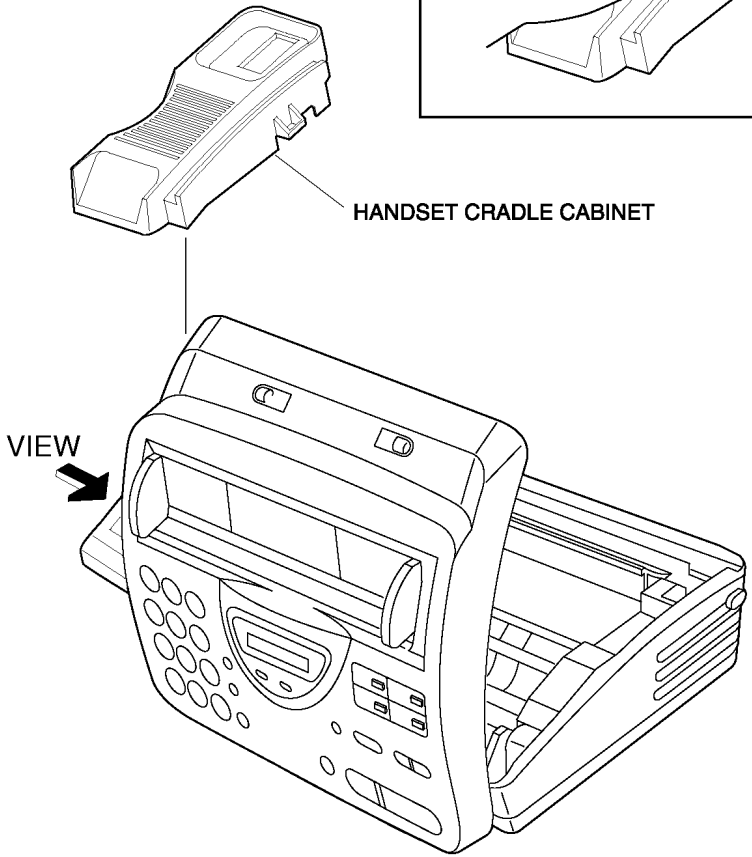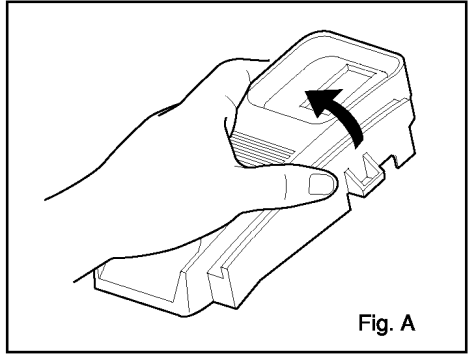
Caution: Be careful not to damage the tabs with a screwdriver.

VIEW
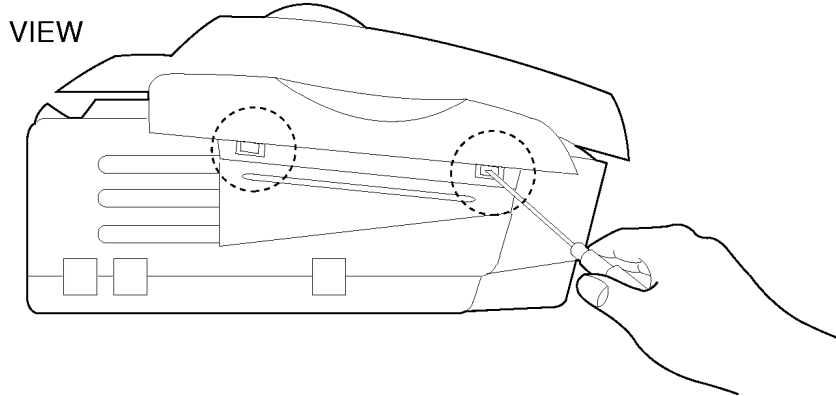
Ref. No. 2	**HOW TO REMOVE THE HOOK BUTTON AND SPEAKER**
Procedure 1→2	1) Remove the handset cradle cabinet. 2) Remove the hook button. 3) Remove the speaker.

HOOK BUTTON

SPEAKER
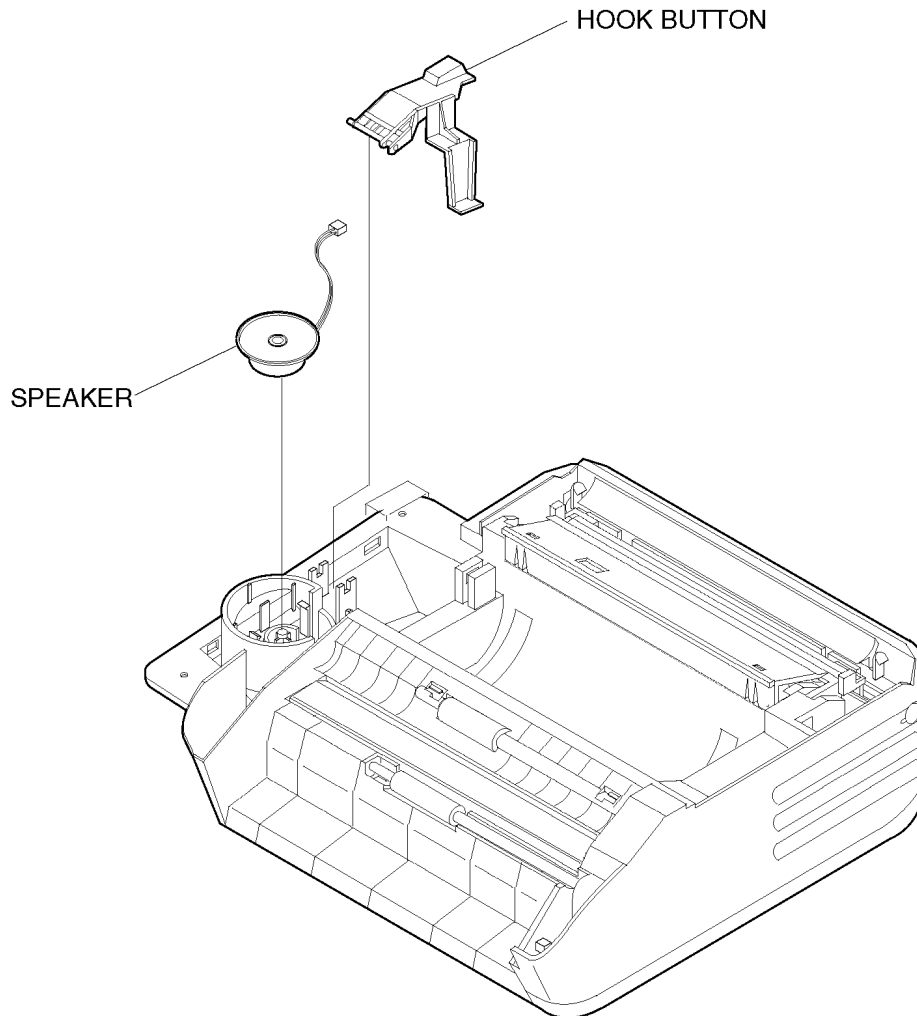
Ref. No. 3	HOW TO REMOVE THE OPERATION BLOCK
3	

1) Push the front lid open button in the direction of the arrow to open the operation block.
2) Lift up the lead and remove the arm (See Fig. A.)
3) Remove the arm.(See Fig. B.)
4) Lift up the operation block.

Note: The arm cannot be removed if the operation panel is opened all the way. Open the operation panel approximately at a 45° to 60° angle to remove the arm.

Fig. A
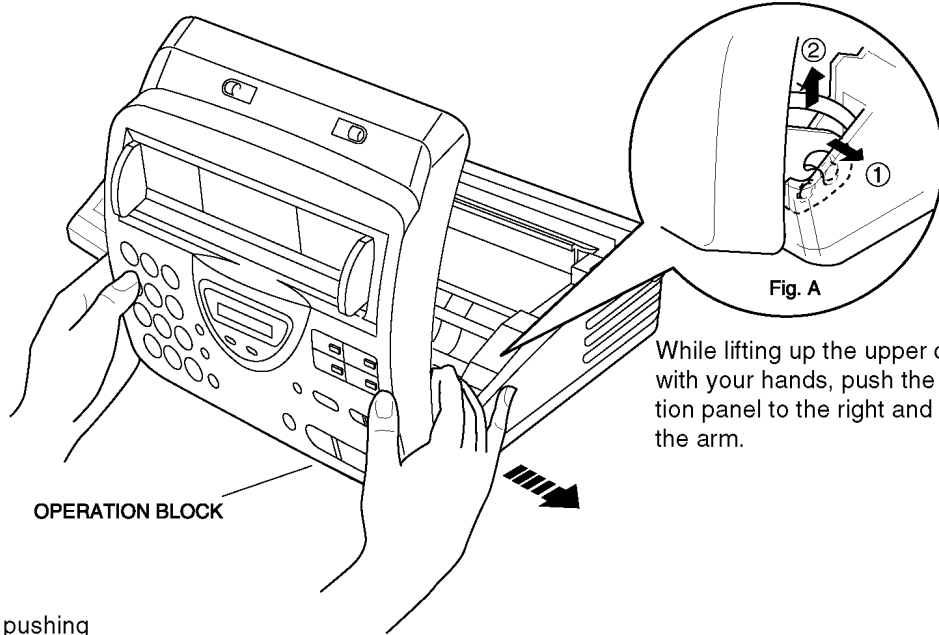
OPERATION BLOCK

While lifting up the upper cabinet with your hands, push the operation panel to the right and remove the arm.

Remove the arm while pushing the operation panel to the left, as in Fig. A.

Fig. B
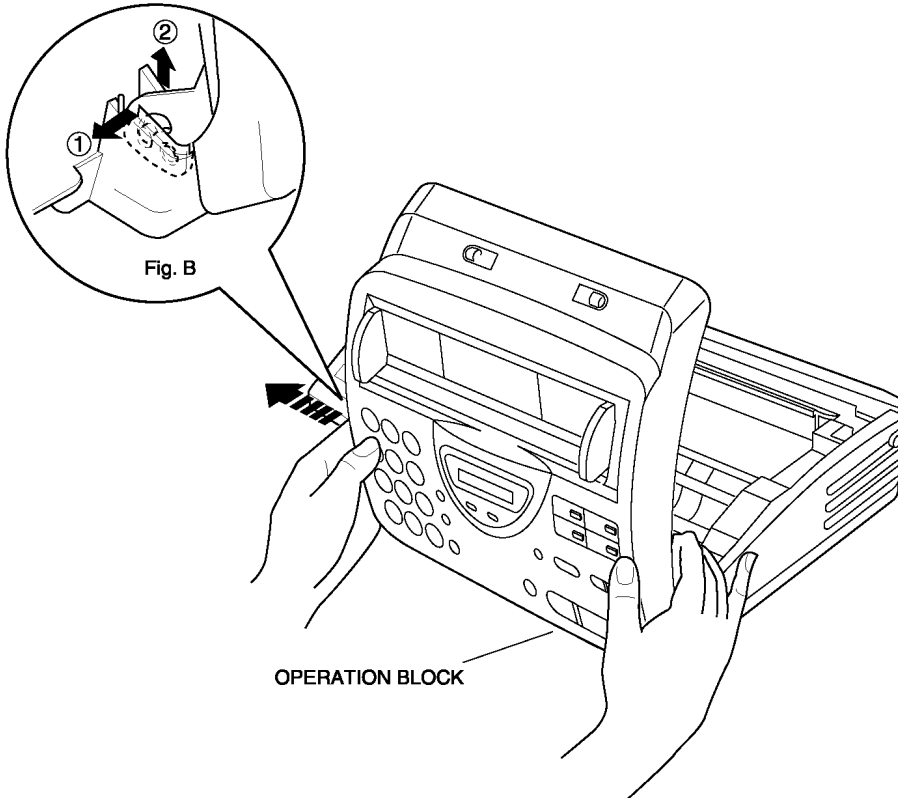
OPERATION BLOCK

Ref. No. 4	**HOW TO REMOVE THE OPERATION BOARD AND LCD**
Procedure 3→4	1) Remove the 4 screws (A) and the operation block cover. 2) Remove the operation board. 3) Remove the document guides.

SEPARATION RUBBER

OPERATION PANELCOVER

OPERATION BOARD

DOCUMENT GUIDE

DOCUMENT GUIDE
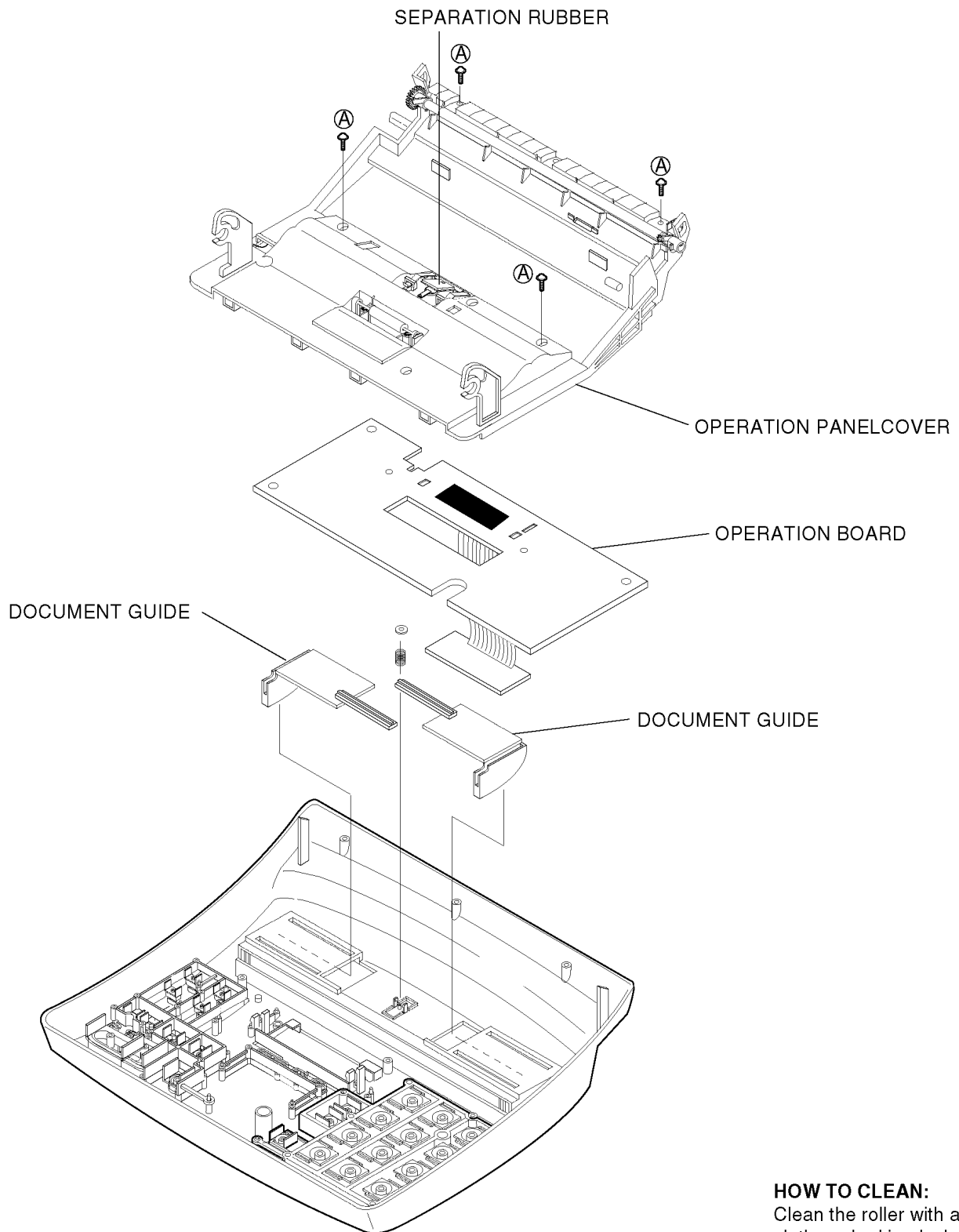
HOW TO CLEAN:
Clean the roller with a
cloth soaked in alcohol.

Ref. No. 5	**HOW TO REMOVE THE BOTTOM FRAME**
Procedure 5	1) Remove the 8 screws (A). 2) Remove the bottom frame.
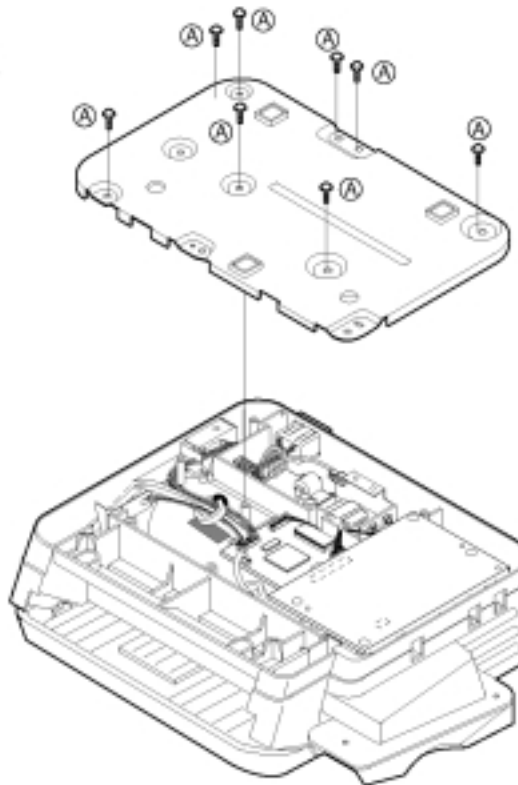
Ref. No. 6	**HOW TO REMOVE THE ANALOG BOARD AND DIGITAL BOARD**
Procedure 5→6	1) Remove the 2 screws (A). 2) Remove the 1 connector. 3) Remove the analog board. 4) Remove the 7 connectors. 5) Remove the digital board.

ANALOG BOARD

CONNECTORS (B)

CONNECTOR (A)

DIGITAL BOARD
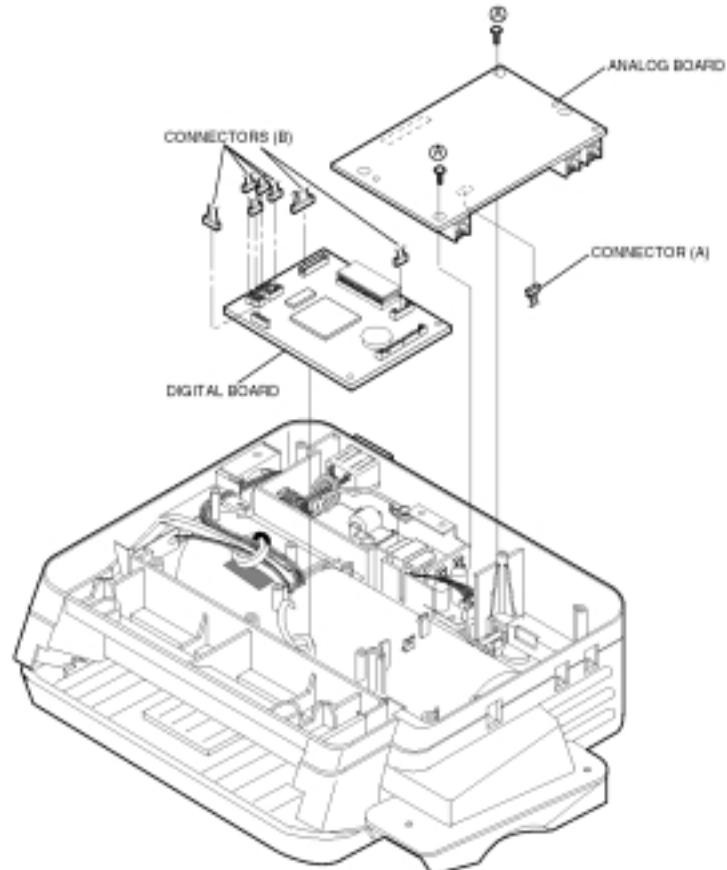
Ref. No. 7	HOW TO REMOVE THE POWER SUPPLY BOARD AND AC INLET
Procedure 5→6→7	

1) Remove the 1 screw (A) and remove the connector.
2) Remove the power supply board.
1) Remove the 1 screw (B).
3) Remove the AC inlet.

CONNECTOR

CONNECTOR

AC INLET

B

POWER SUPPLY BOARD
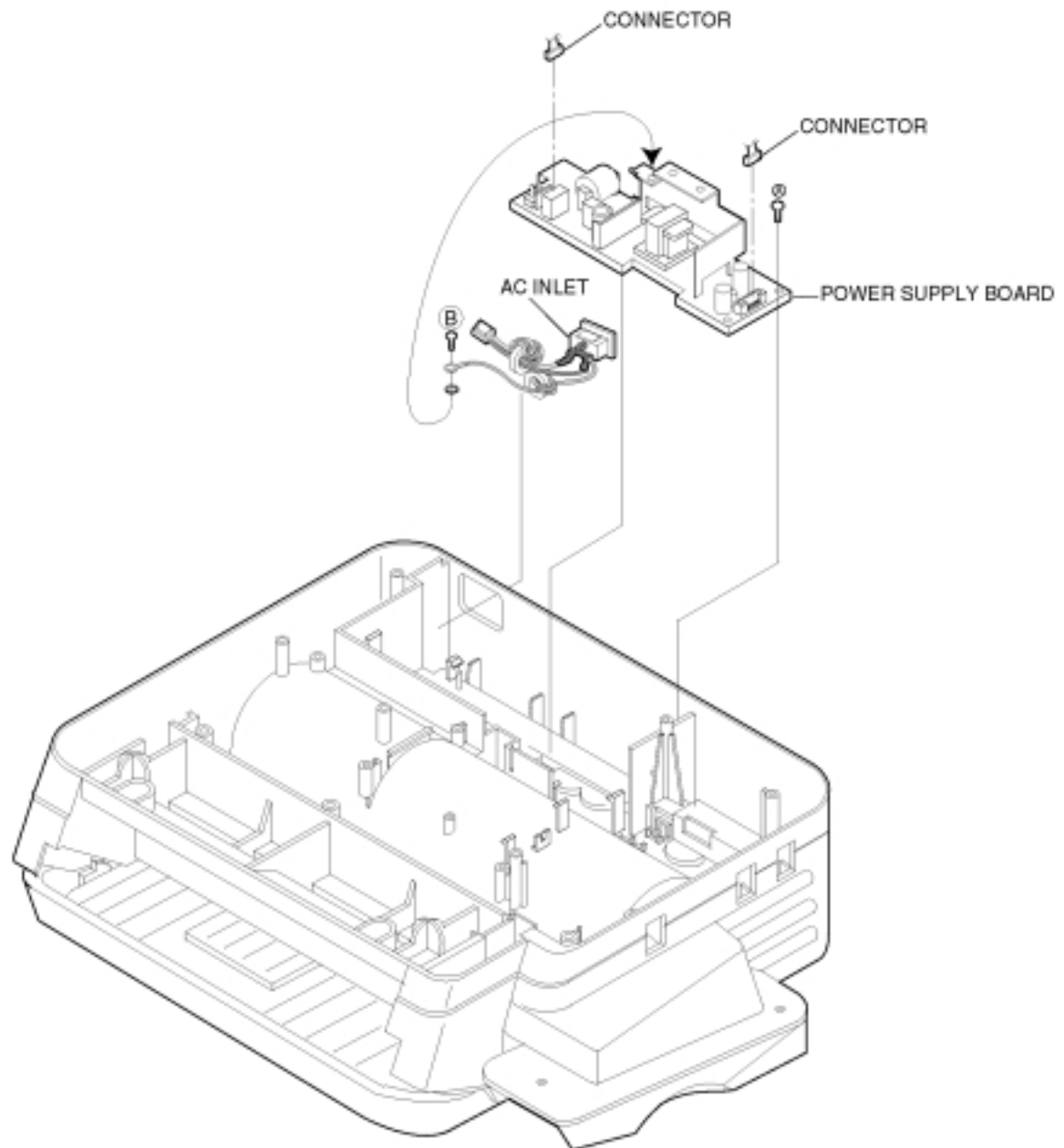
Ref. No.8	HOW TO REMOVE THE MOTOR BLOCK
Procedure 5→ 8	1) Remove the 2 screw (A). 2) Remove the MOTOR BLOCK.
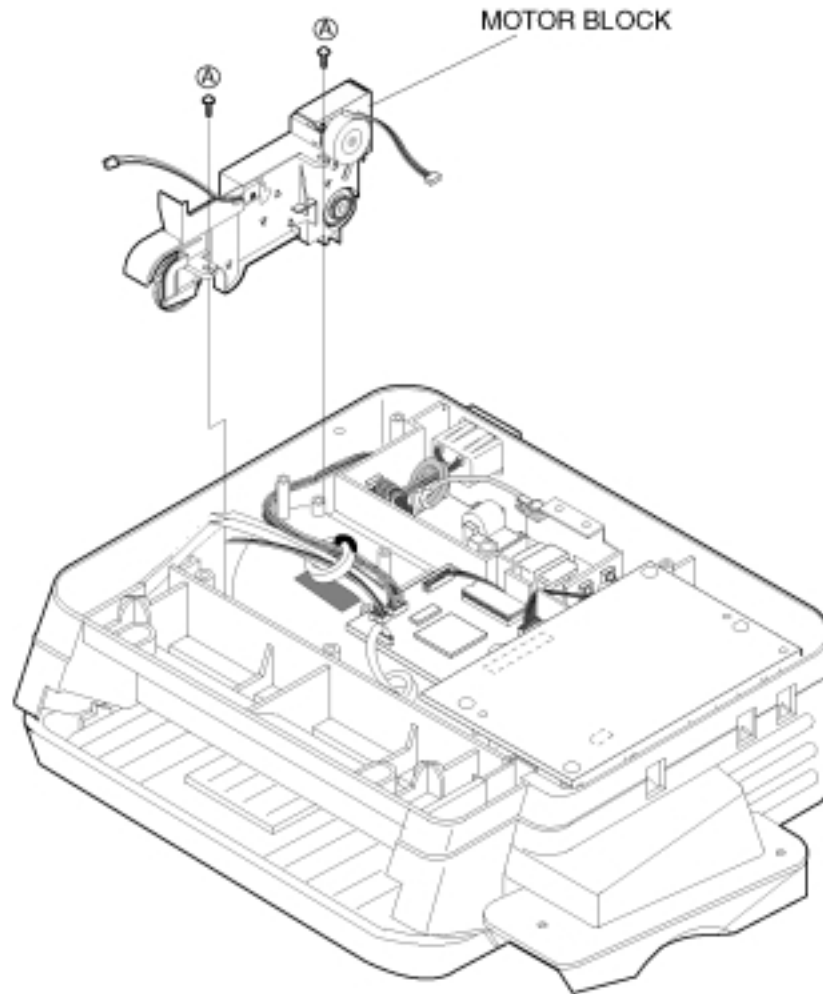
MOTOR BLOCK

Ref. No.8(a)	**HOW TO REMOVE THE MOTOR BLOCK**
Procedure 8(a)	

1) Remove the SW.
2) Remove the MOTOR.
3) Remove the CHASSIS.

SW

CHASSIS

MOTOR
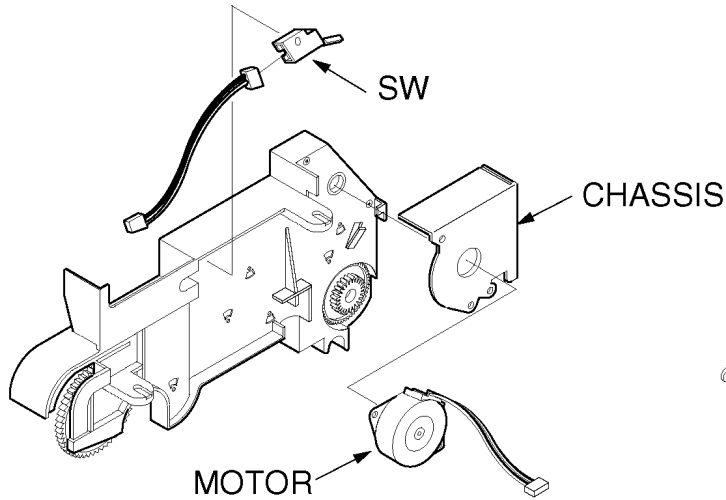
1) Remove the SPRING.
2) Remove the gear (1).
3) Remove the gear (2).
4) Remove the gear (3).
5) Remove the screws (A).
6) Remove the gear (4).

(4)

(A)

(3)

SPRING

(2)

(1)
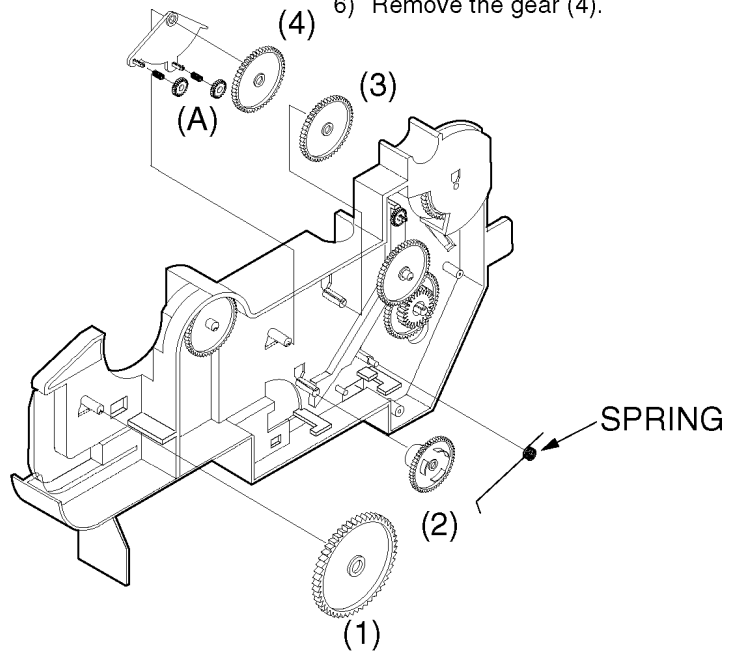
1) Remove the screw (A).
2) Remove the gear (5).
3) Remove the gear (6).
4) Remove the gear (7).
5) Remove the gear (8).

(8)

(A)

(5)

(7)

(6)
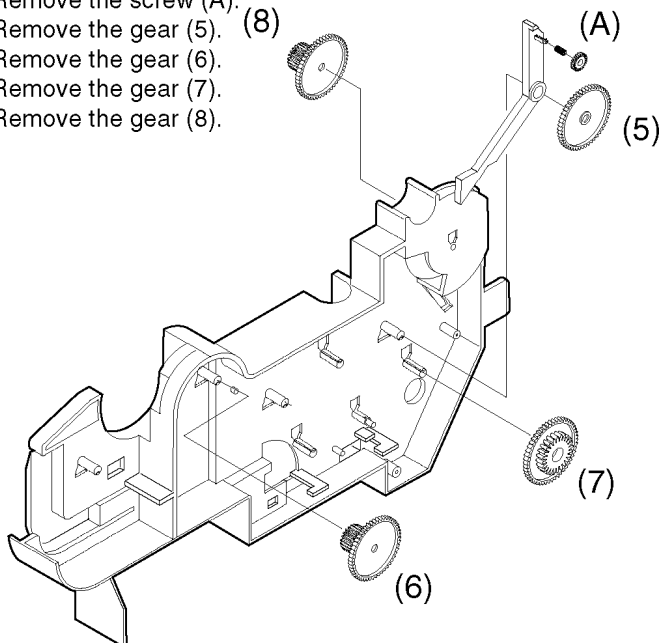
Ref. No. 9	**HOW TO REMOVE THE IMAGE SENSOR**
Procedure 9	1) Remove the sheet (Fig. A). 2) Remove the image sensor.
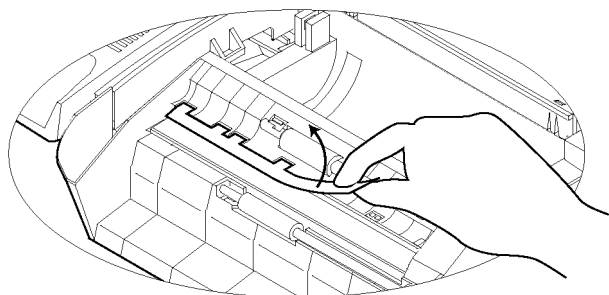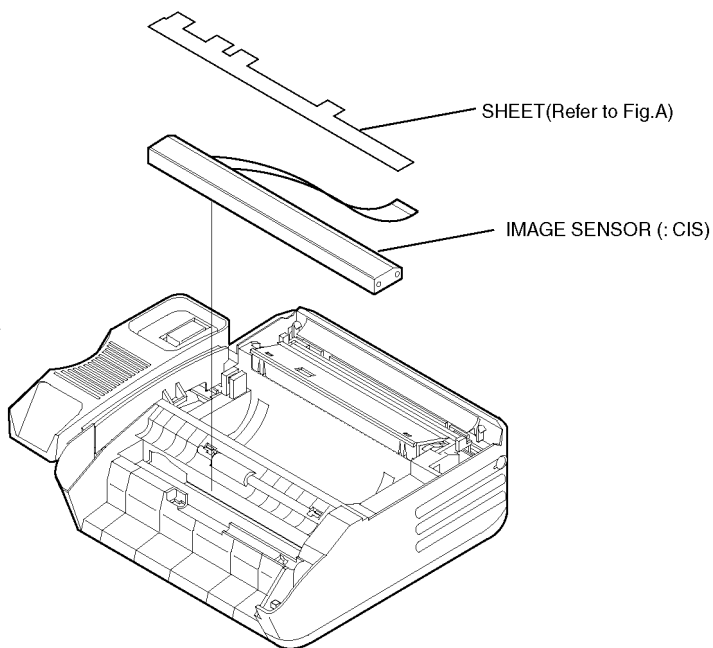
SHEET(Refer to Fig.A)

IMAGE SENSOR (: CIS)

Fig. A

Ref. No. 10	**HOW TO REMOVE THE ROLLERS**

Procedure 5→6→ 9→10	(Fig.A)
	   1) Remove the image sensor.(See Ref. No.9.)
	   2) Remove the rollers.
	   3) Remove the stopper with a flathead screwdriver.
	
	(Fig.B)
	   1) Remove the analog board and digital board.(See Ref. 6.)
	   2) Remove the roller.
	   3) Remove the stoppers from the roller shaft and replace the roller.

STOPPER

DOCUMENT FEED ROLLER

STOPPER

STOPPER

SEPARATION ROLLER

STOPPER
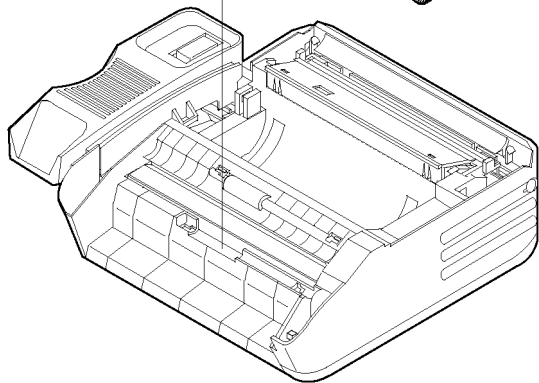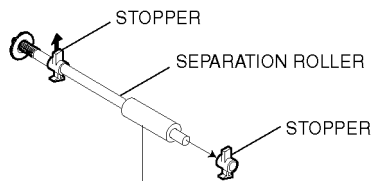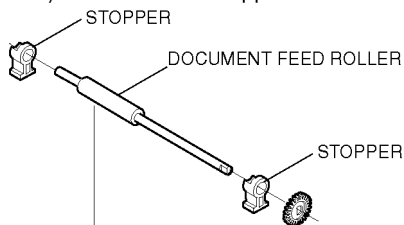
(Fig.A)
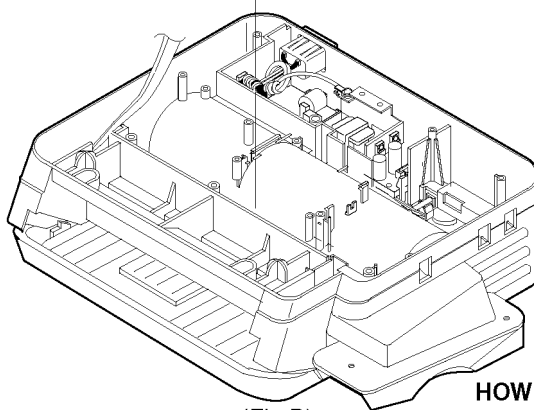
(Fig.B)

HOW TO CLEAN:
Clean the roller with a
cloth soaked in alcohol.

Ref. No. 11	**HOW TO REMOVE THE THERMAL HEAD ROLLER**
Procedure 11	1) Push the front lid open button in the direction of the arrow to open the operation block. 2) Remove the head cover. 3) Remove the lock lever shaft with a screwdriver as shown in Fig. A. 4) Remove the 2 connector. 5) Remove the thermal head. 6) Remove the lock lever.

(Fig.A)

HEAD COVER

THERMAL HEAD

LOCK LEVER

SPRING
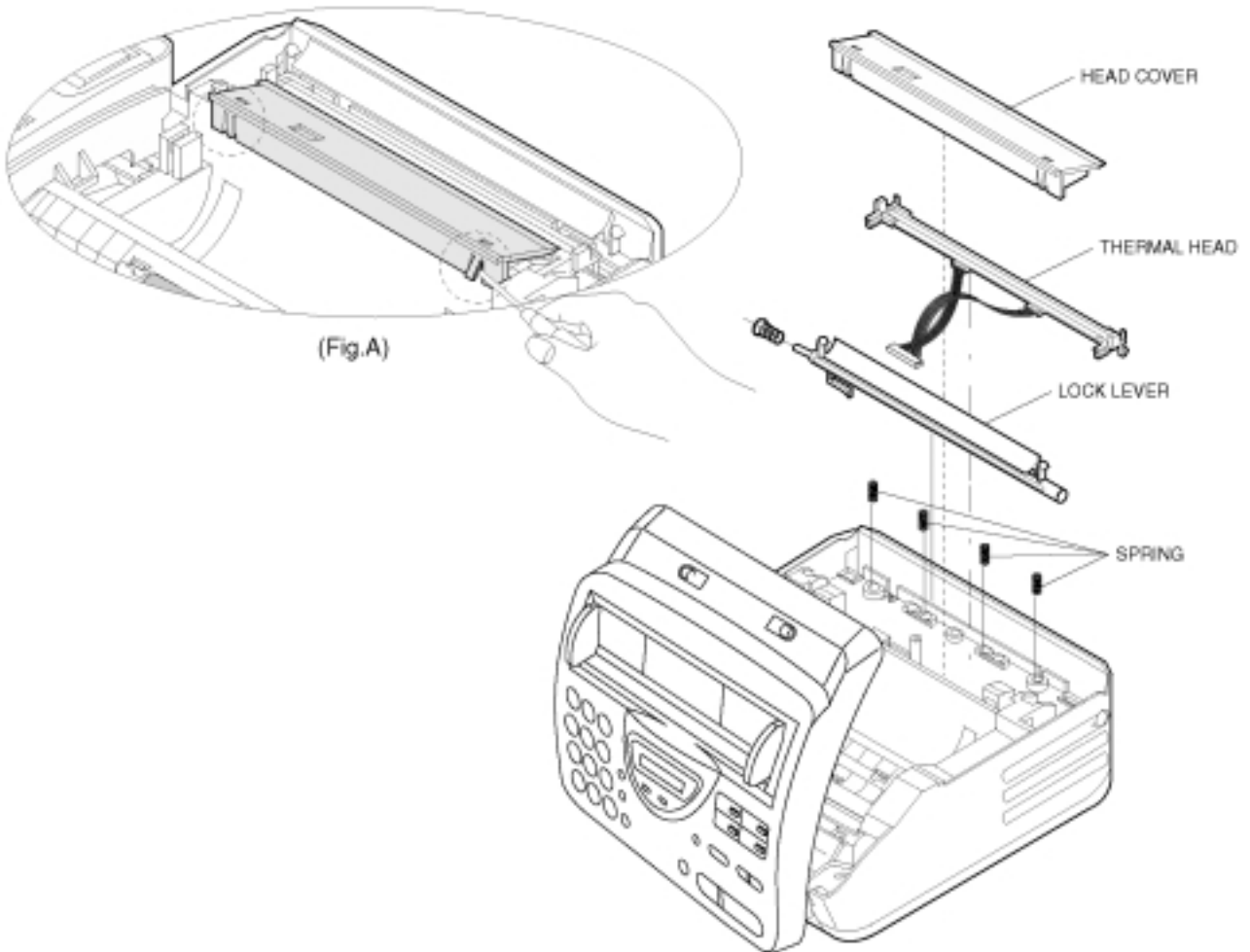
Ref. No. 12	**HOW TO REMOVE THE DOCUMENT TRAY**
Procedure 12	1) Push the bottom of the tray in the direction of the arrows.

PAPER STACKER
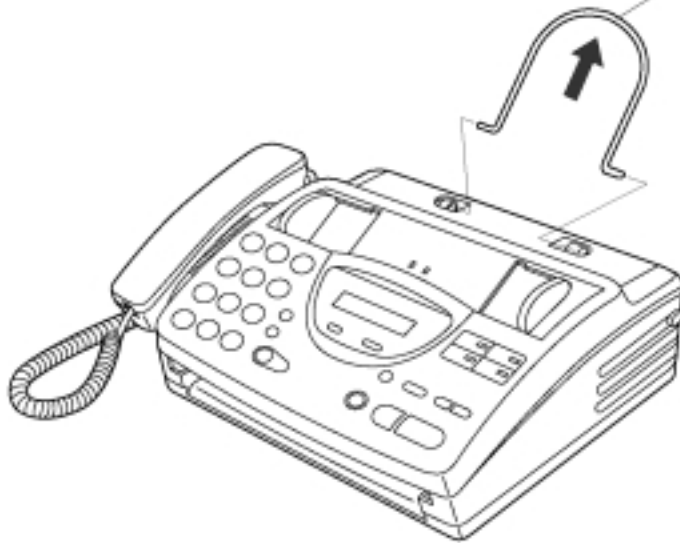
[(Ref. No.6) for page]

Harness installation position
(To prevent harnesses from getting caught during the installation.)
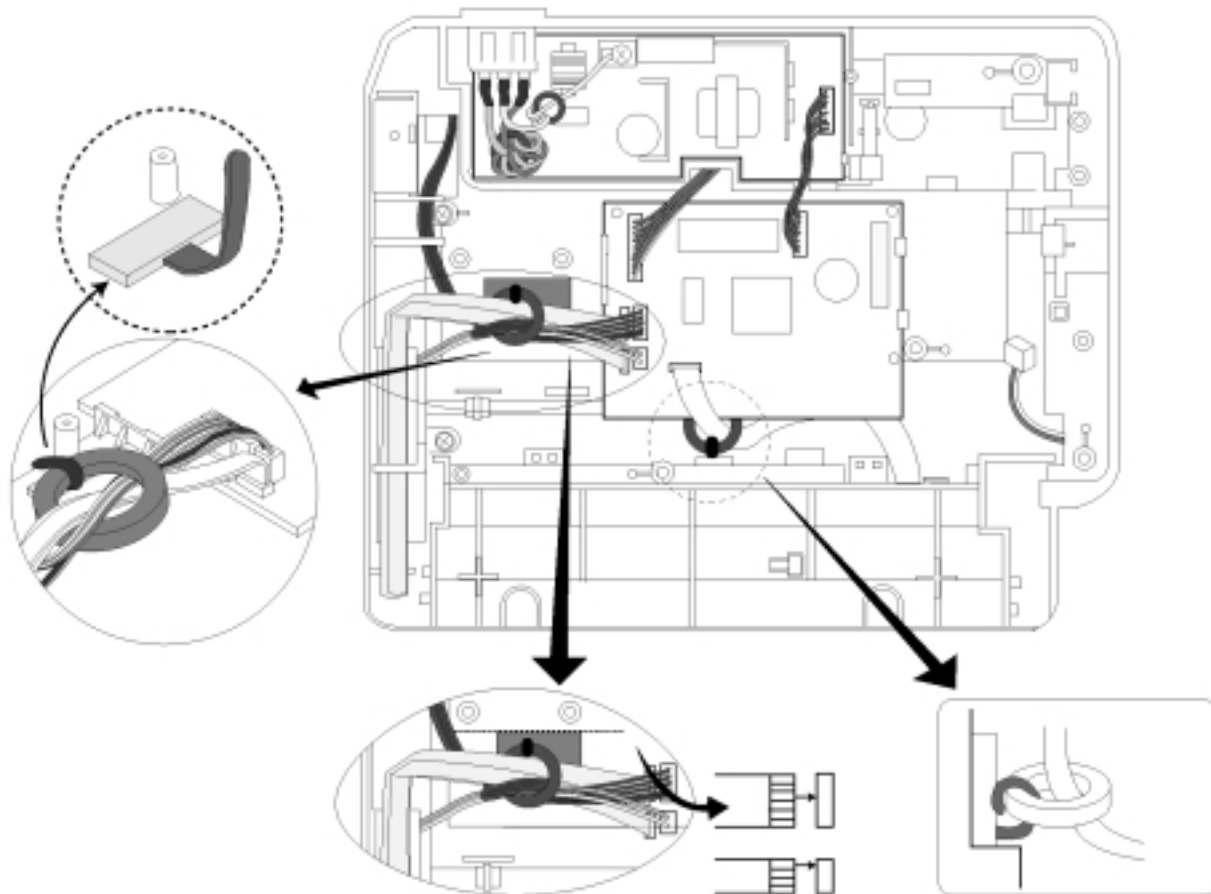
5 HOW TO REPLACE THE FLAT PACKAGE IC

If you do not have the special tools (for example: SPOT HEATER) to remove the SPOT HEATER´S Flat IC, if you have solder (large amount), a soldering iron, and a cutter knife, you can easily remove the ICs even if there are more than 100 pins.

5.1. PREPARATION

・SOLDER

Sparkle Solder 115A-1, 115B-1 OR Almit Solder KR-19, KR-19RMA

・Soldering iron

Recommended power consumption is between 30 W to 40 W.
Temperature of Copper Rod 662 ± 50°F (350 ± 10°C)
(An expert may handle a 60~80 W iron, but a beginner might damage the foil by overheating.)

・Flux
HI115 Specific gravity 0.863
(Original flux should be replaced daily.)

5.2. FLAT PACKAGE IC REMOVAL PROCEDURE

1. When all of the IC lead cannot been seen at the standard degree, fill with large quantities of solder.

   Note:

   If you do not fill with solder and directly cut the IC lead with the cutter, stress may build up directly in the P.C. board´s pattern. If you do not fill with large quantities of solder as in step 1, the P.C. board pattern may be removed.
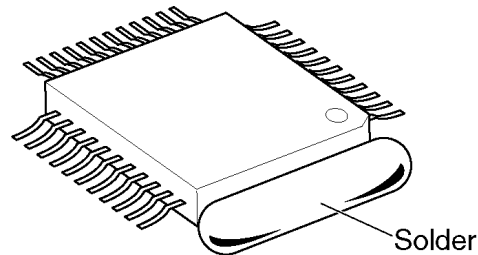
2. Using a cutter, cut the lead at the source. (Cut the contents with a cutter lightly, 5 or 6 times.)
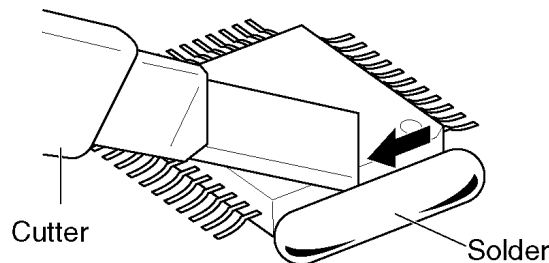
3. Remove when the solder melts. (Remove the lead at the same time.)
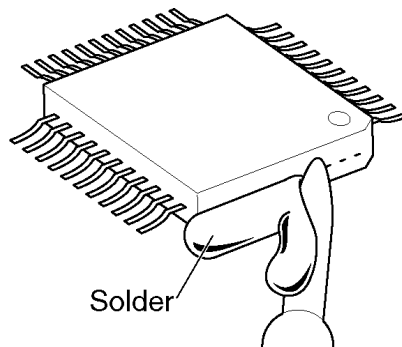
After removing the Flat IC and when attaching a new IC, remove any of the excess solder on the land using the soldering wire, etc. If the excess solder is not removed from the land, the IC will slip and not be attached properly

5.3. FLAT PACKAGE IC INSTALLATION PROCEDURE

1) Temporarily fix the FLAT PACKAGE IC by soldering on the two marked pins.
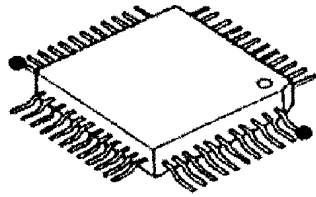
● ——————— Temporary soldering point.

*Check the accuracy of the IC setting with the corresponding soldering foil.

2) Apply flux to all pins of the FLAT PACKAGE IC.
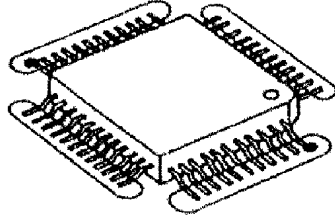
Flux

3) Solder using the specified solder, in the direction of the arrow, by sliding the soldering iron.

Soldering iron

Specified solder
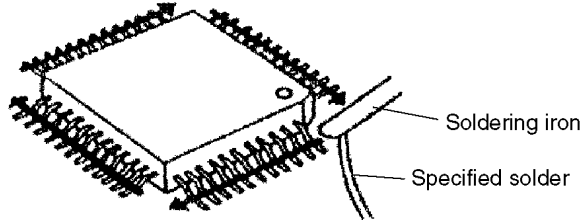
5.4. BRIDGE MODIFICATION PROCEDURE

1) Lightly re-solder the bridged portion.

2) Remove the remaining solder along the pins using a soldering iron as shown in the figure below.

bridge
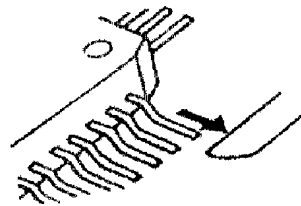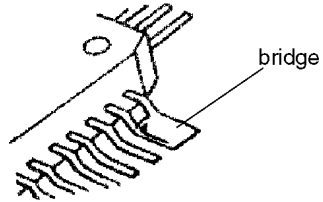
6 CIRCUIT OPERATIONS

6.1. CONNECTION DIAGRAM
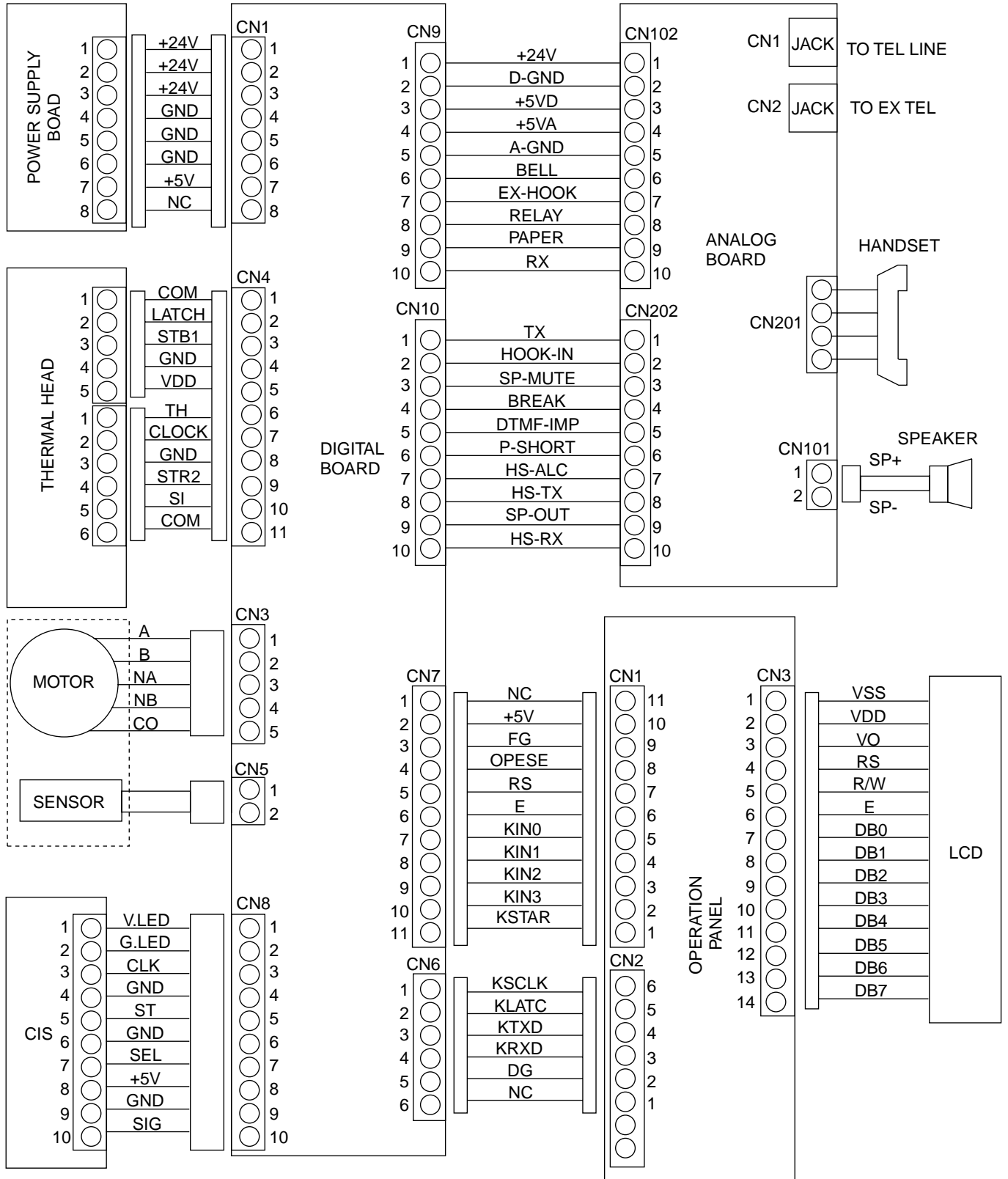
6.2.   GENERAL BLOCK DIAGRAM

The control section will be explained as shown in the block diagram.

1. ASIC (IC1)

   Composed mainly of an address decoder, modem control section, CPU and RTC.

   Controls the general FAX operations.

   Controls the operation panel I/F.

   Controls the thermal head I/F and CIS I/F.

   Executes image processing.

   Monitors the H/S volume.

   I/O ports

2. ROM (IC2)

   Contains all of the program instructions for unit operations.

3. Static RAM (IC3)

   This memory is used mainly for the parameter working storage area.

4. MODEM (Incruded in IC1)

   Modem for the FAX.

5. Read Section

   Contact Image Sensor (CIS) to read transmitting documents.

6. Thermal Head

   Contains heating elements for dot matrix image printing.

7. Motor driver (IC7)

   Drives the motor and CIS LED.

8. Reset circuit (IC4)

   Provides a reset pulse to each of the major ICs.

9. Analog board

   Composed of an ITS circuit and NCU circuit.

10. Sensor Section

    Composed of a document sensor, recording paper sensor, motor position sensors, read position sensor.

11. Power supply switching board section

    Supplies +5V and +24V to the unit.

12. CODEC (IC5)

    A/D and D/A converter.

POWER SUPPLY

AC220V

REG

+24V   +5V

OPERATION PANEL

SELE CTOR

LCD

SENSOR

KEY MATRIX

DIGITAL BOARD

ANALOG BOARD

+24V   +5V

THERMAL HEAD

MOS SW   REG   3.3V

SRAM 256k   ROM 1M

CODEC

ANA LOG SW

+24V

+5V

ANA LOG SW

RLY

LINE

5V   RESET

EXT. TEL

BELL   PC

I/O   PRINTER CONTROL   OSC   CPU I/F   OP PANEL I/F   VOL

ASIC

HOOK   HOOK SW

PAPER   PAPER

CIS

A/D   IMAGE PROCESSING   ROM   MOTOR I/F   MODEM   RTC

SP MUTE

SP AMP

SENSOR   MOTOR

SPEAKER

HANDSET
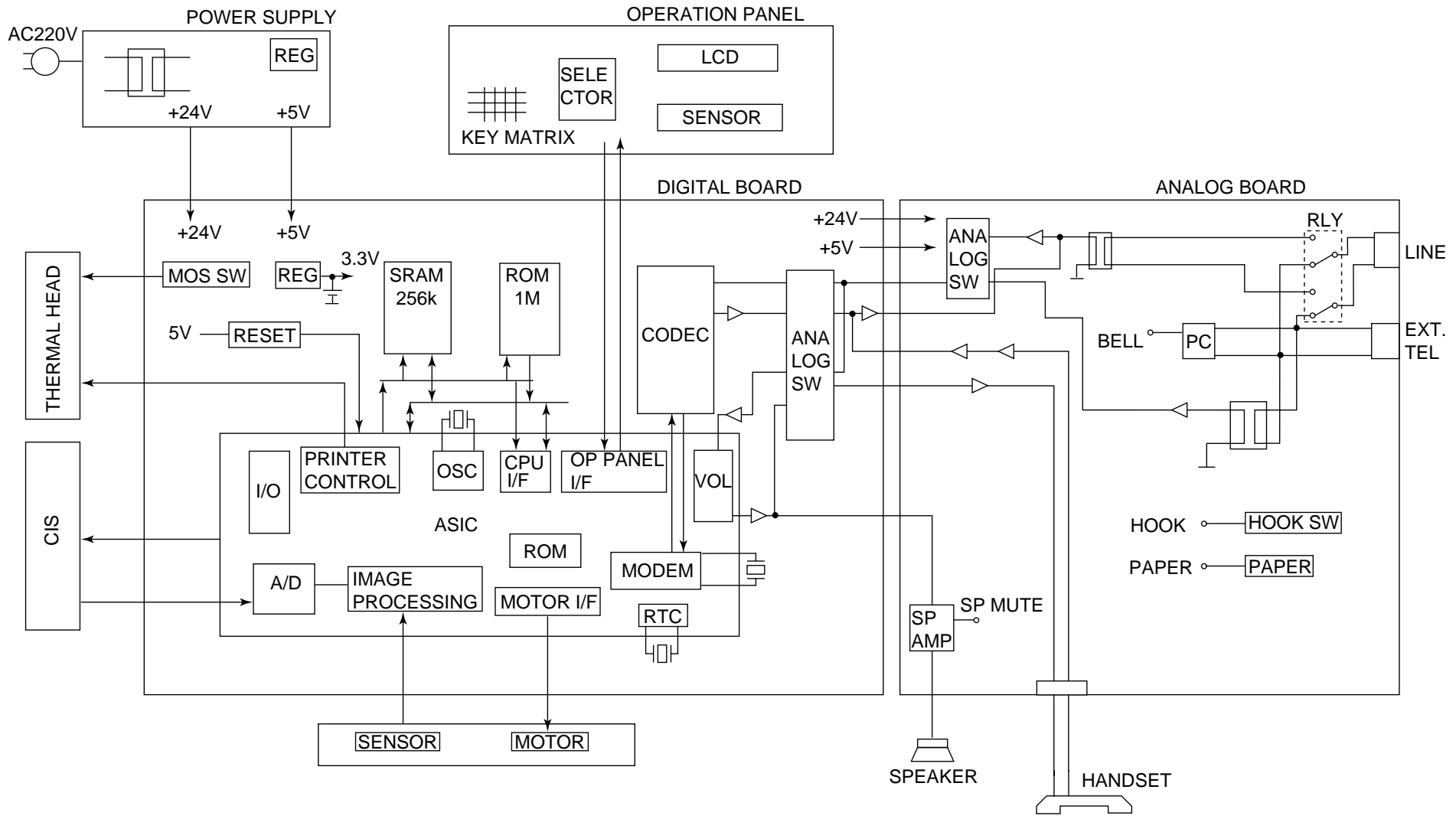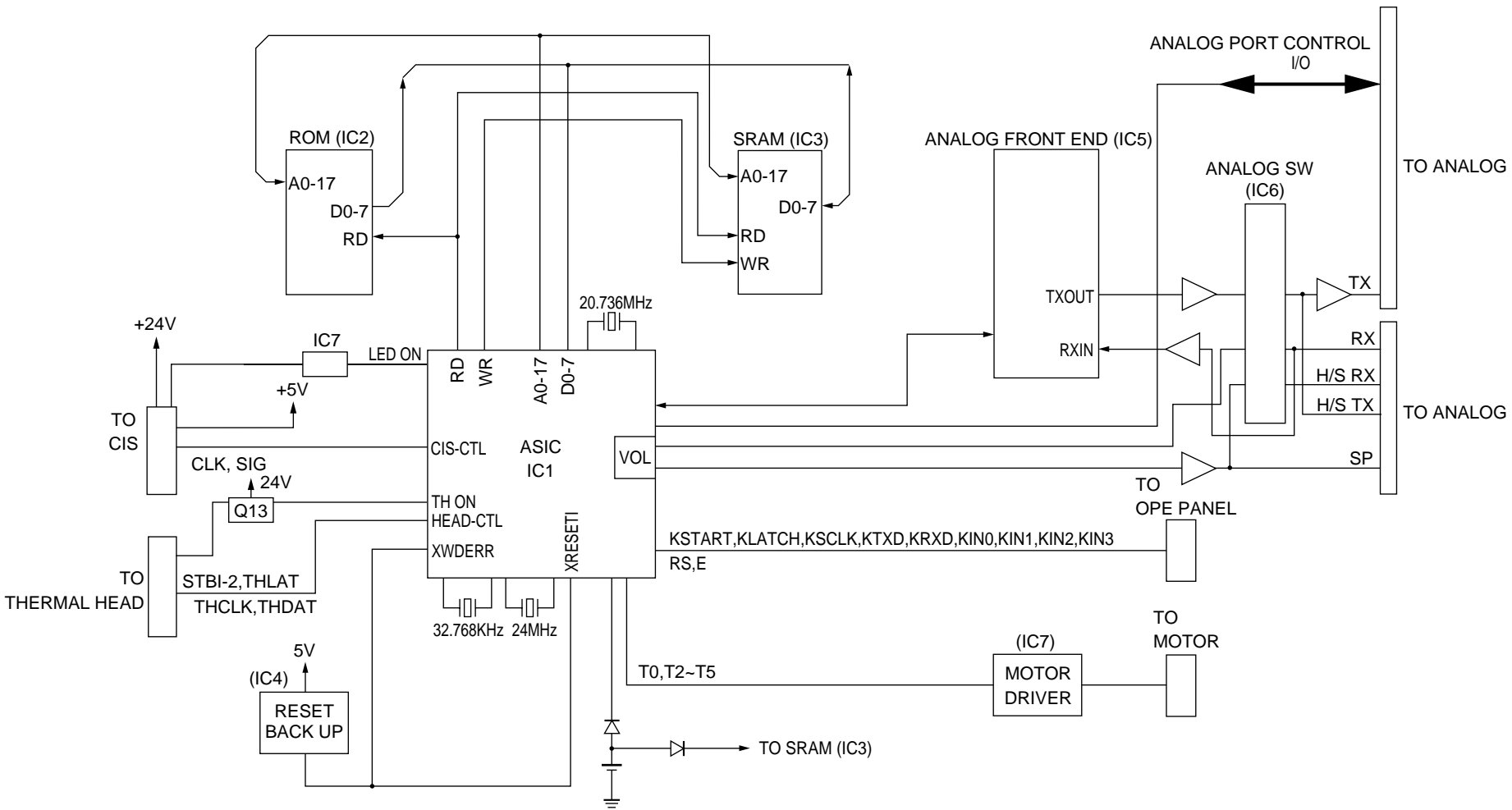
6.3.2. ASIC (IC1)

This custom IC is used for general FAX operations.

1. CPU

   This model uses a Z80 equivalent CPU operating at 6MHz.
   Many of the peripheral functions are handled by custom designed LSIS. As a result, the CPU only needs to process the result.

2. RTC

   Real time clock.

3. DECODER

   Decodes the address.

4. MODEM

   Execute modulation and demodulation for the FAX.

5. ROM/RAM I/F

   Controls the SELECT signal of ROM or RAM and bank switching.

6. CIS I/F

   Controls document reading.

7. IMAGE DATA RAM

   This is inside the ASIC and has 8KB which is used for image processing.

8. THERMAL HEAD I/F

   Transmits the recorded data to the thermal head.

9. MOTOR I/F

   Controls the motor which feeds the document and feeds the reading document.

10. OPERATION PANEL I/F

   Serial interface with Operation Panel.

11. I/O PORT

   I/O Port Interface (for analog board port control).

12. ANALOG UNIT

   Electronic volume for the handset and monitor.
   Sends beep tones, etc.

Explanation of the Pin Distribution (IC1)

Pin	Pin Name	Buffer Power supply	5V Tolerant	Signal Name	I/O	Description
1	X32OUT	VDDRTC	-	X32OUT		32.768kHz oscillator for RTC (built-in feed back resistor)
2	X32IN	VDDRTC	NO	X32IN		32.768kHz oscillator for RTC (built-in feed back resistor)
3	VDDRTC			+3.3V/BATT		32.768kHz backup power supply for RTC
4	XBACKEN	VDDRTC	YES	XRESET		Backup enable
5	VDDSRAM			+3.3V/BATT		RAMCS buffer/backup power supply for reset
6	XRAMCS	VDDSRAM	-	VDDSRAM		SRAM chip select ("H": 3.3V or BATT)
7	XRAMCE2/ALARM	VDDSRAM	-	OPEN		Not used
8	FTG	MULT3/5	NO	FTG	O	FTG
9	F1	MULT3/5	NO	F1	O	F1 (50%/75% selector)
10	MULT3/5			+5V		Power supply
11	VSS			DG		Ground
12	F2/OP50	MULT3/5	NO	E	O	LCD control
13	FR/OP51	MULT3/5	NO	OPEN	O	Not used
14	XRESET	3.3V	YES	XRESET		Reset input for internal digital circuit
15	VSS			DG		Ground
16	XORESET	3.3V	-	XORESET		Reset output
17	XRESETI	3.3V	YES	XRESETI		Voltage detector IC output for reset
18	XWDERR	3.3V	YES	XWDERR		Watch dog timer error
19	XRSTSWO/OP82	3.3V	YES	OPEN	O	Not used
20	VIDRST/IOP20	3.3V	YES	OPEN	O	Not used
21	SPHCLK/IOP21	3.3V	YES	OPEN	O	Not used
22	DARKON/IOP22	3.3V	YES	OPEN	O	Not used
23	ADSEL2/IOP23	3.3V	YES	OPEN	O	Not used
24	BELL/OP	3.3V	YES	OPEN	O	Not used
25	3.3V			+3.3V		Power supply

Pin	Pin Name	Buffer Power supply	5V Tolerant	Signal Name	I/O	Description
26	IRDATXD/IOP81	3.3V	YES	OPEN	O	Not used
27	IRDARXD/IOP80	3.3V	YES	OPEN	O	Not used
28	TXD/IOP30	3.3V	YES	BREAK	O	TEL Line Break Control
29	RXD/IOP31	3.3V	YES	H/S ALC	I	Not used (Hardware Control)
30	XRTS/IOP32	3.3V	YES	DTMF IMP	O	DTMF-IMP Control
31	XCTS/IOP33	3.3V	YES	P-SHORT	O	P-SHORT Control
32	XDSR/IOP34	3.3V	YES	OPEN	O	Not used
33	DCD/IOP35	3.3V	YES	OPEN	O	Not used
34	XDTR/IOP36	3.3V	YES	OPEN	O	Not used
35	RI/CLK/IOP37	3.3V	YES	OPEN	O	Not used
36	IOP90	3.3V	YES	OPEN	O	Not used
37	IOP91	3.3V	YES	OPEN	O	Not used
38	VSS			DG		Ground
39	IOP92	3.3V	YES	OPEN	O	Not used
40	IOP93	3.3V	YES	OPEN	O	Not used
41	IOP94	3.3V	YES	OPEN	O	Not used
42	IOP95	3.3V	YES	OPEN	O	Not used
43	3.3V			+3.3V		Power supply
44	FMEMCS/IOP27	3.3V	YES	OPEN	O	Not used
45	FMEMDO/IOP26	3.3V	YES		I	Not used
46	FMEMDI/IOP25	3.3V	YES		O	Not used
47	FMEMCLK/IOP24	3.3V	YES	TELRXENB	I/O	Telephone RX root control
48	CBUSY2	3.3V	-	OPEN		Not used
49	CSO/OP70	3.3V	-	OPEN		Not used
50	CBUSY1	3.3V	YES	OPEN		Not used
51	CCLK	3.3V	YES	OPEN		Not used
52	CSI	3.3V	YES	OPEN		Not used
53	MIDAT/IOP45	MULT3/5	YES	MTXENB	O	Modem TX route control
54	MICLK/IOP46	MULT3/5	YES	MOMRXENB	O	Modem RX route control
55	MILAT/IOP47	MULT3/5	YES	H/SRXENB	O	Handset RX route control
56	RVN	3.3V	YES	BELL		Bell signal detection
57	CPC	3.3V	YES	PAPER		Recording paper detection
58	TONE1	3.3V	-	TONE1		Not used
59	TONE2	3.3V	-	TONE2		Tone2 (bell alarm key tone)
60	VSS			DG		Ground
61	3.3V			+3.3V		Power supply
62	EVOLIN	(3.3V)	-	EVOL IN		Electronic volume (handset monitor)
63	EVOLOUT	(3.3V)	-	EVOL OUT		Electronic volume (handset monitor)
64	EVOLREF	(3.3V)	-	EVOL REF		Electronic volume (handset monitor)
65	VSS			DG		Ground
66	IOP57	3.3V	YES	EX-HOOK	O	Not used
67	XMDMINT	3.3V	YES	XINTMDM		Modem interrupt
68	XINTMDM	3.3V	-	XMDMINT		Modem INT output/general output
69	XNMI/XINT	3.3V	YES	XNMI		NMI
70	EYECKO	MULT3/5	NO	EYECKO		Modem AFE connection (APDMCK)
71	APDMDT	3.3V	YES	APDMDT		Modem AFE connection
72	C3	MULT3/5	NO	C3		Modem AFE connection
73	C4	MULT3/5	NO	C4		Modem AFE connection
74	C5	MULT3/5	NO	C5		Modem AFE connection
75	MULT3/5			+5V		Power supply
76	DPDMDT	MULT3/5	NO	DPDMDT		Modem AFE connection
77	DPDMCK	MULT3/5	NO	DPDMCK		Modem AFE connection
78	MUTE	MULT3/5	NO	MUTE		Modem AFE connection
79	XEYESYC	MULT3/5	NO	XEYESYC		Modem eye pattern EYESYNC
80	EYEDAT	MULT3/5	NO	EYEDAT		Modem eye pattern EYEDAT
81	XRESETD	MULT3/5	NO	XRESETD		Modem AFE connection
82	CPUCK	3.3V	-	CPUCK		CPU clock (6MHz) output
83	XHOLDAK	3.3V	-	OPEN		Not used
84	XWAIT/IP60	3.3V	YES	HOOK		Hook detection
85	XHOLD/IP61	3.3V	YES	PULL DOWN		Not used
86	XHSTRD/IOP40	3.3V	YES	H/S MUTE	O	Handset TX mute
87	VSS			DG		Ground
88	XINMDM	3.3V	NO			20.736MHz crystal oscillator buffer
89	XOUTMDM	3.3V	-			20.736MHz crystal oscillator buffer
90	TEST1	3.3V	NO	+3.3V		Test pin. fixed High
91	TEST2	3.3V	NO	+3.3V		Test pin. fixed High
92	XTEST	3.3V	-	XTEST		24MHz clock output

Pin	Pin Name	Buffer Power supply	5V Tolerant	Signal Name	I/O	Description
93	TEST3	3.3V	NO	+3.3V		Test pin. fixed High
94	XOUT	3.3V	-	XOUT		24MHz oscillator
95	XIN	3.3V	NO	XIN		24MHz oscillator
96	VSS			DG		Ground
97	3.3V			+3.3V		Power supply
98	TEST4	3.3V	NO	+3.3V		Test pin. fixed High
99	XHSTWR/IOP41	3.3V	YES	RLY	O	Tel line relay control
100	XOPRBE/MUX/OP53	3.3V	-	SP-MUTE		Speaker mute control
101	XRAS/IOP42	3.3V	NO	OPEN	O	Not used
102	XCAS1/IOP43	3.3V	NO	OPEN	O	Not used
103	XCAS2/IOP44	3.3V	NO	OPEN	O	Not used
104	DB3	3.3V	YES	D3		Data bus
105	DB2	3.3V	YES	2		Data bus
106	DB4	3.3V	YES	4		Data bus
107	DB1	3.3V	YES	1		Data bus
108	DB5	3.3V	YES	5		Data bus
109	DB0	3.3V	YES	0		Data bus
110	DB6	3.3V	YES	6		Data bus
111	DB7	3.3V	YES	D7		Data bus
112	XROMCS	3.3V	-	XROMCS		ROM chip select
113	XRD	3.3V	-	/RD		Read signal output
114	3.3V			+3.3V		Power supply
115	XWR	3.3V	-	/WR		Write signal output
116	ADR0	3.3V	-	A0		Address bus
117	ADR1	3.3V	-	1		Address bus
118	ADR2	3.3V	-	2		Address bus
119	VSS			DG		Ground
120	ADR3	3.3V	-	3		Address bus
121	ADR4	3.3V	-	4		Address bus
122	ADR5	3.3V	-	5		Address bus
123	ADR6	3.3V	-	6		Address bus
124	ADR7	3.3V	-	7		Address bus
125	ADR8	3.3V	-	8		Address bus
126	ADR9	3.3V	-	9		Address bus
127	ADR10	3.3V	-	10		Address bus
128	VSS			DG		Ground
129	3.3V			+3.3V		Power supply
130	ADR11	3.3V	-	11		Address bus
131	ADR12	3.3V	-	12		Address bus
132	RBA0	3.3V	-	A13		Bank address
133	RBA1	3.3V	-	14		Bank address
134	RBA2	3.3V	-	15		Bank address
135	RBA3	3.3V	-	16		Bank address
136	RBA4	3.3V	-	17		Bank address
137	RBA5/OP	3.3V	-	18		Not used
138	RBA6/IOP	3.3V	NO	19	O	Not used
139	XRESCS1/OP72	3.3V	-	OPEN		Not used
140	XRESCS2/OP71	3.3V	-	OPEN		Not used
141	XMDMCS/OP	3.3V	-	OPEN		Not used
142	VSS			DG		Ground
143	XRESCS3/OP52	3.3V	-	OPEN		Not used
144	20KOSC/IOP56	3.3V	YES	OPEN	O	Not used
145	ADR13	3.3V	-	OPEN		Not used
146	ADR14	3.3V	-	OPEN		Not used
147	3.3V			+3.3V		Power supply
148	ADR15	3.3V	-	OPEN		Not used
149	RM0/IOP00	3.3V	YES	T5	O	Motor control
150	RM1/IOP01	3.3V	YES	T4	O	Motor control
151	RM2/IOP02	3.3V	YES	T3	O	Motor control
152	RM3/IOP03	3.3V	YES	T2	O	Motor control
153	RXE/IP04	3.3V	YES	T0	O	Motor control
154	TM0/IOP10	3.3V	YES	LEDON	O	CIS LED control
155	TM1/IOP11	3.3V	YES	OPEN	O	Not used
156	TM2/IOP12	3.3V	YES	OPEN	I/O	Not used
157	TM3/IOP13	3.3V	YES	OPEN	O	Not used
158	TXE/IP14	3.3V	YES	PULL DOWN	I	Pull down
159	STB1	MULT3/5	NO	STB1	O	Thermal head strobe 1

Pin	Pin Name	Buffer Power supply	5V Tolerant	Signal Name	I/O	Description
160	STB2	MULT3/5	NO	STB2	O	Thermal head strobe 2
161	STB3	MULT3/5	NO	OPEN	O	Not used
162	STB4	MULT3/5	NO	OPEN	O	Not used
163	THDAT	MULT3/5	NO	TH DATA	O	Thermal data
164	VSS			DG		Ground
165	MULT3/5	-		+5V		Power supply for THCLK DAT LAT STB
166	THCLK	MULT3/5	NO	TH CLK	O	Thermal head clock
167	THLAT	MULT3/5	NO	TH LAT	O	Thermal head latch
168	STBNP	3.3V	YES	CIS SEL		
169	3.3V			+3.3V		Power supply
170	TXD2/IOP	3.3V	YES	TH ON	O	Thermal head 24V ON
171	RXD2/IOP	3.3V	YES	RS	I/O	LCD control
172	RTS2/IOP	3.3V	YES	OPEN	O	Not used
173	CTS2/IOP	3.3V	YES	CIS ON	O	Not used
174	DSR2/IOP	3.3V	YES	MOTOR PO.	I	Motor position detection
175	DCD2/IOP	3.3V	YES	OPEN	O	Not used
176	DTR2/IOP	3.3V	YES	OPEN	O	Not used
177	RI2/IOP	3.3V	YES	OPEN	O	Not used
178	XRSTSWI/IP83	3.3V	YES	PULL DOWN		Pull down
179	KEYIN0	3.3V	YES	KIN0	I/O	Key read
180	KEYIN1	3.3V	YES	KIN1	I/O	Key read
181	KEYIN2	3.3V	YES	KIN2	I/O	Key read document sensor control
182	KEYIN3	3.3V	YES	KIN3	I/O	Key read read start position sensor control
183	KEYIN4	3.3V	YES	OPEN	O	Not used
184	KEYIN5	3.3V	YES	OPEN	O	Not used
185	OPLED	3.3V	YES	OPESEL	OD	Operation panel control
186	VSS			DG		GND
187	3.3V			3.3V	OD	Power supply
188	KSTART	3.3V	YES	KSTART	OD	LCD control
189	KLATCH	3.3V	YES	KLATCH	OD	Key scan LCD control
190	KSCLK	3.3V	YES	KSCLK	OD	Key scan LCD control
191	KTXD	3.3V	YES	KTXD	I	Key scan LCD control
192	KRXD	3.3V	YES	KRXD	O	Document read start position sensor
193	ADSEL1	3.3V	YES	ADSEL1		Thermal head temperature detection trigger
194	VSSC			DG		Ground for analog image process
195	VREFB	Analog	-	VREFB		A/D reference-
196	VREFT	Analog	-	VREFT		A/D reference+
197	BIAS	Analog	-	BIAS		
198	VREFH	Analog	-	VREFH		A/D reference center
199	VDDC			+3.3V		Power supply for analog image process
200	VSSA			DG		Ground for analog image process
201	VDDA			+3.3V		Power supply for analog image process
202	VDDB			+3.3V		Power supply for analog image process
203	VCL	Analog	-	VCL		Clamp level
204	AIN3	Analog	-	AIN3		
205	AIN1	Analog	-	AIN1		Analog image signal (CIS output signal input)
206	AMON	Analog	-	OPEN		Not used
207	AIN2	Analog	-	AIN2		Thermistor voltage detection
208	VSSB			DG		Ground for analog image process

6.3.3. ROM (IC2)

This 128 KB ROM (OTPROM or MASKROM) has 32 KB of common area and bank area (BK4~BK15).
The capacity of each bank is 8 KB.
The addresses of the common area are from 0000H to 7FFFH, and addresses 8000H to 9FFFH are for the bank area.

6.3.4. RAM (IC3)

This 32 KB RAM has 8 KB of common area and bank area (BK0, BK1).
The capacity of each bank is 12 KB.
The addresses of the common area are from D000H to EFFFH, and addresses A000H to CFFFH are for the bank area.

6.3.5. Reset Circuit

The output from pin 1 of the Reset IC (IC4) resets the gate array (IC1).

1. During a power surge, a positive reset pulse of 175 msec or more is generated and the system is reset completely.
   This is done to prevent partial resetting and system runaway during a power fluctuation.

Timing Chart
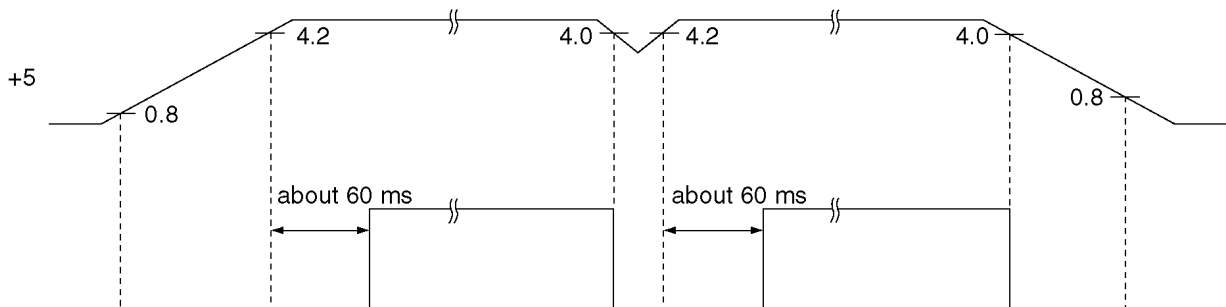
2. When pin 1 of IC4 becomes low, it will prohibit the RAM (IC3) from changing data.
   The RAM (IC3) will go into the backup mode, when it is backed up by a lithium battery.

Circuit Diagram
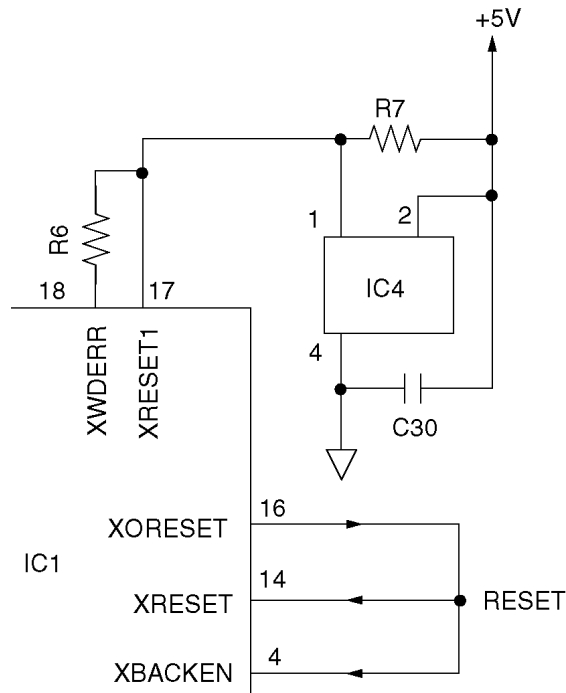
3. The watch dog timer, built-in the gate array (IC1), is initialized about every 1.5 ms.
   When a watch dog error occurs, pin 18 of the gate array (IC1) becomes low.
   The terminal of the WDERR signal is connected to the reset line so the WDERR signal works as the reset signal.

6.3.6. SRAM and RTC BACK UP CIRCUIT

1. **Function**

   This unit has a lithium battery (BAT1) which works for the RAM (IC3) and Real Time Clock (RTC, Integrated into ASIC:IC1).
   The user parameter for auto dial numbers, the transmission ID, the system setup date and so on are stored in the RAM (IC3).
   The RTC continues functioning, even when the power switch is OFF, backed up by a lithium battery.

2. **Circuit Operation**

   When the power is turned ON, power is supplied RAM (IC3) and RTC (IC1).
   At this time, the voltage at pin 28 of RAM is +5V and pin 3 of RTC (IC1) is +3.3V. When the power is turned OFF, the battery
   supplies the power to RAM and RTC through J1, R14,D1 or D7. At that time, the voltage at pin 28 of RAM and pin 3 of IC1 are
   about +2.5V. When the power is OFF and the +5V and +3.3V voltages decrease, IC4 detects them and LOW is input to pin 17
   of IC1. Pin 16 of IC1 outputs the reset signals. Pin 28 of RAM (IC3) and pin 3 of RTC (IC1) become low, then RAM and RTC
   (IC1) go into the back up mode, when the power consumption is lower.

Circuit Diagram
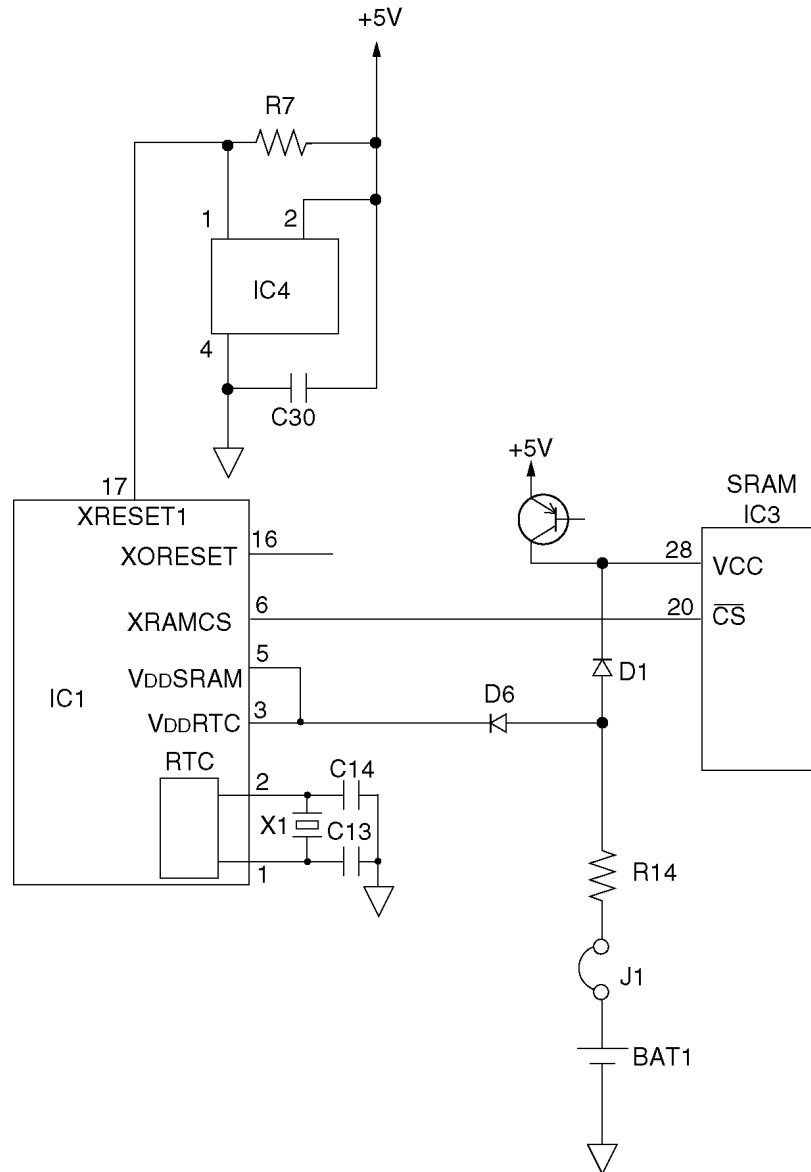
6.3.7. SUPERVISION CIRCUIT FOR THE THERMAL HEAD TEMPERATURE

1. **Function**

The thermistor changes the resistor according to the temperature and uses the thermistor´s characteristics.
The output of pin 193 of IC1 becomes a low level.
Then when it becomes a high level, it triggers point (A).
In point (C), according to the voltage output time, the thermal head´s temperature is detected.

After the thermal head temperature is converted to voltage in (B), it is then changed to digital data in the A/D converter inside IC1. The CPU decides the strobe width of the thermal head according to this value. Therefore, this circuit can keep the thermal head at an even temperature in order to stabilize the printing density and prevent the head from being overheated.

Circuit Diagram
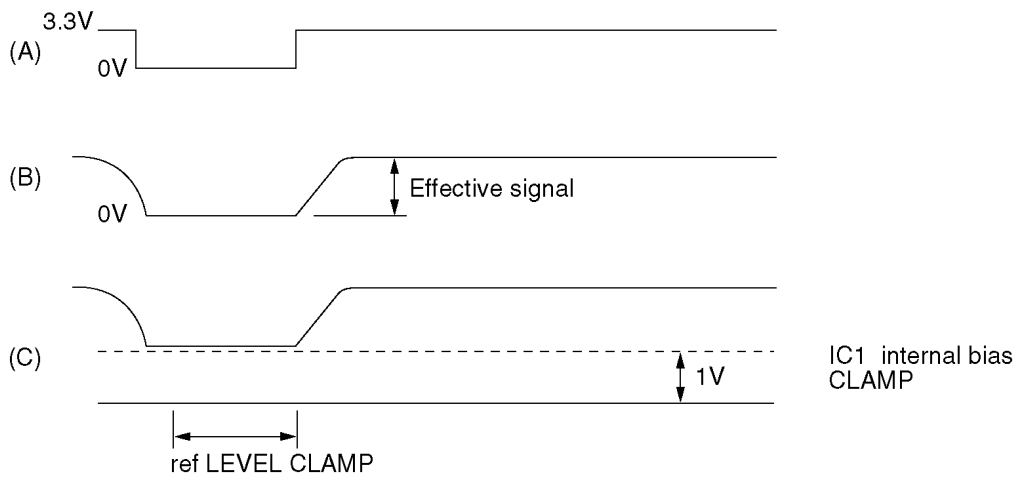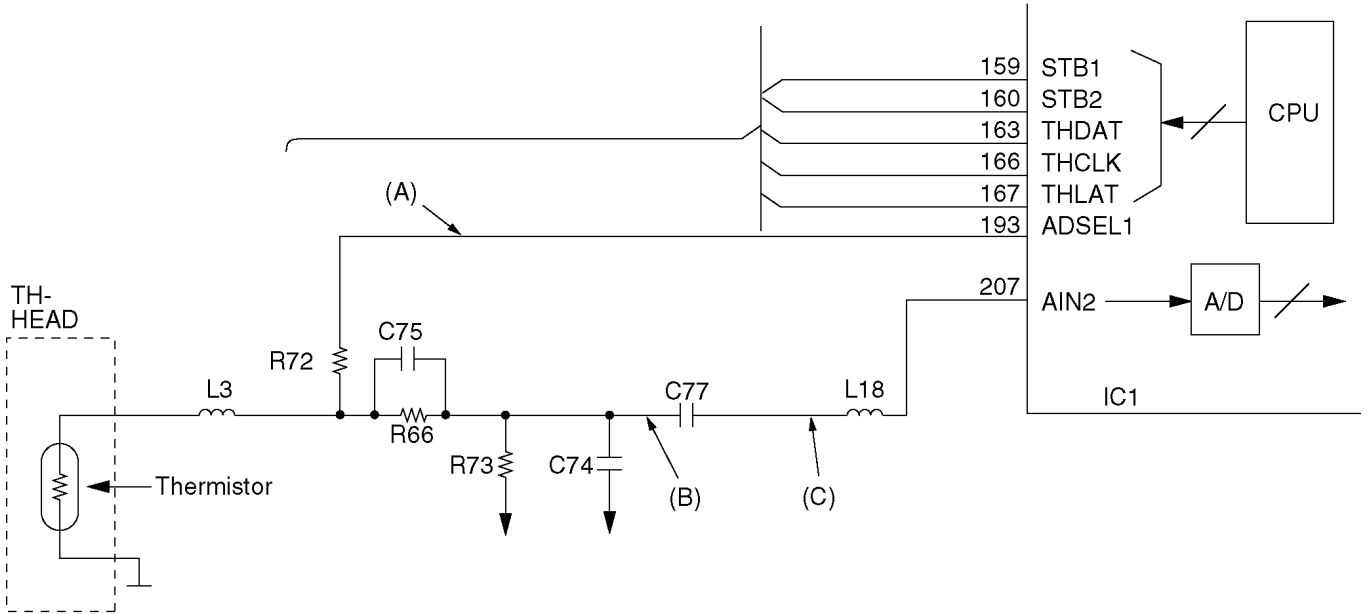
6.3.8. LED ARRAY(CIS)

The LED ARRAY will light during transmission and copying as a light source to recognize document characters, patterns, or graphics on a document.
It is also possible to light the LED ARRAY in the test mode.

Circuit Diagram
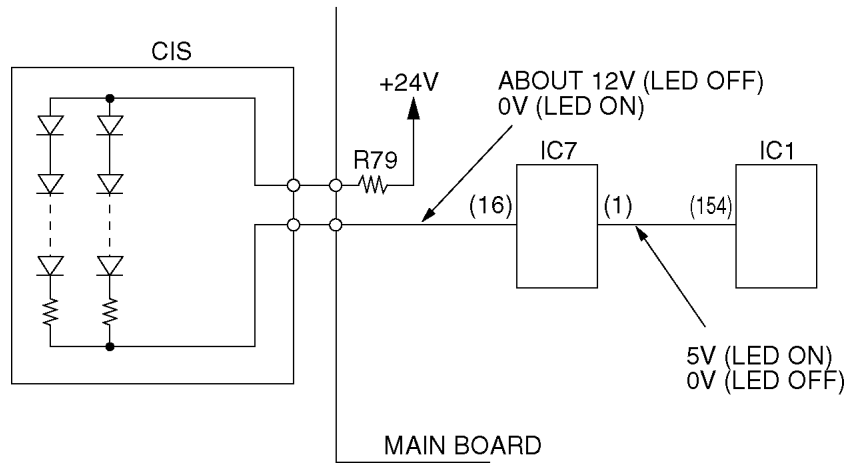
6.4. FACSIMILE SECTION

6.4.1. IMAGE DATA FLOW DURING FACSIMILE OPERATION

COPY (Fine, Super-Fine, Half Tone)

1. Line information is read by CIS, via route (1), and is input to IC1.

2. In IC1, the data is adjusted to a suitable level for A/D conversion in the Analog Signal Processing Section, and via route (2) it is input to A/D conversion (8 bit). After finishing A/D conversion, the data is input to the Image Processing Section via route (3). Then via routes (4) and (5), it is stored in RAM as shading data.

3. The draft´s information that is read by CIS is input to IC1 via route (1). After it is adjusted to a suitable level for A/D conversion via route (2), the draft´s information is converted to A/D (8 bit), and it is input to the Image Processing Section. The other side, the shading data which flows from RAM via routes (6) and (7), is input to the Image Processing Section. After finishing the draft´s information image processing, white is regarded as "0" and black is regarded as "1".
Then via routes (4) and (5), they are stored in RAM.

4. The white/black data stored as above is input to the P/S converter via routes (6) and (8).
The white/black data converted to serial data in the P/S converter is input to the Thermal Head via route (9) and is printed out on recording paper.

   Note:

   Standard: Reads 3.58 times/mm

   Fine: Reads 7.7 times/mm

   Super-Fine: Reads 15.4 times/mm

Transmission

1. Same processing as COPY items 1) - 3).

2. The data stored in RAM of IC1 is output from IC1 via routes (6) and (10), and is stored in the system bus.
Via route (11), it is stored in the communication buffer inside RAM (IC3).

3. While fetching data stored in the communication buffer synchronous with the modem, the CPU inputs data to the modem along route (12) and (14).
In the analog front end IC (IC5) it is converted to serial analog data and forwarded over telephone lines via the NCU Section.

Reception

1. The serial analog image data is received over telephone lines and input to the analog front end IC (IC5) via the NCU section, where it is demodulated to parallel digital data. The balance data is sent to the modem. Then the CPU stores the data in the communication buffer of RAM (IC3) along route (11) and (15).

2. The data stored in RAM (IC3) is decoded by the CPU via route (12), and is stored in RAM by routes (13) and (5).

3. Same processing as **COPY** item 4).

6.4.2. Block Diagram

SYSTEM
BUS

IC1

A / D

(2)

(1) CONTACT
IMAGE
SENSOR

ANALOG
SIGNAL

PROCESSING
SECTION

IC3

RAM

(12)

(11)

(3)

IMAGE
PROCESSING
SECTION

IC2

ROM

(7)   (4)

CPU

(13)   (5)

RAM

(10)   (6)

(8)

(14)

(15)

MODEM

THERMAL
HEAD

(9)

Analog
Front/End

IC5
(AFE)

P/S
CONVERTER

NCU

TEL.LINE
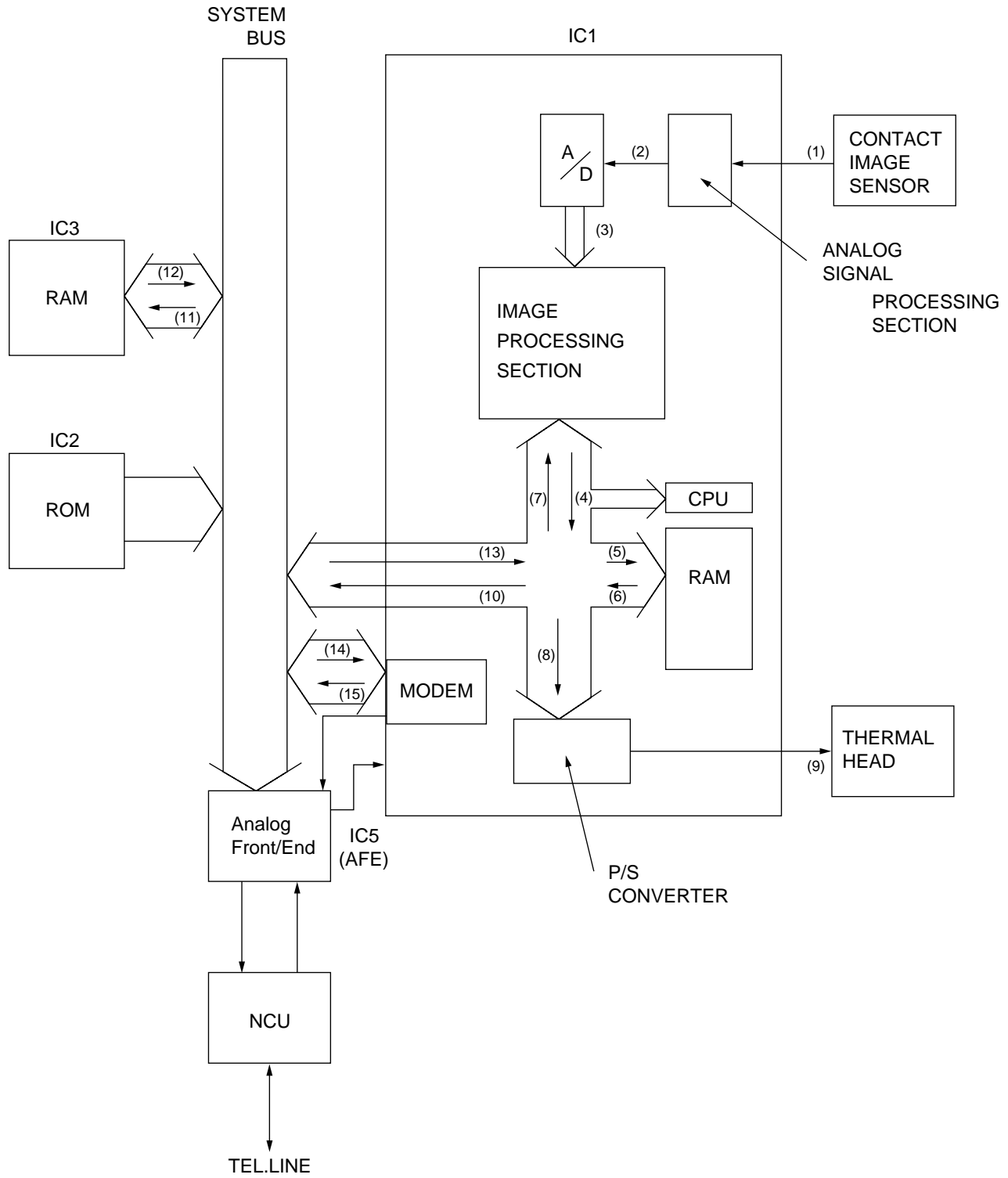
6.4.3. THERMAL HEAD

1. **Function**

   This unit utilizes state of the art thermal printer technology.
   The recording paper (roll paper) is chemically processed. When the thermal head contacts this paper it emits heat momentarily, and black dots (appearing like points) are printed on the paper. If this continues, letters and/or diagrams appear, and the original document is reproduced.

   ### COMPOSITION OF THE RECEIVE RECORD SECTION (THERMAL RECORDING FORMAT)
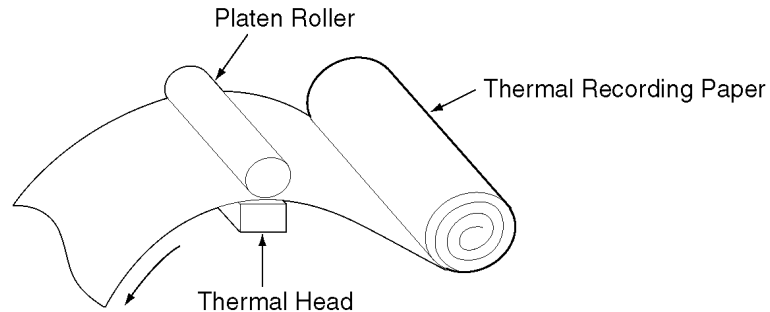
2. **Circuit Operation**

   There are 9 driver ICs aligned horizontally on the thermal head and each one of these ICs can drive 192 heat emitting registers. This means that one line is at a density of 192×9=1728 dots=(8 dots/mm).
   White/Black (white=0, black=1) data in one line increments is synchronized at IC1 pin 166 (THCLK), and sent from IC1 pin 163 (THDAT) to the shift register of the ICs. The shift registers of the 9 ICs are connected in series, and upon the shift of dot increment 1728, all the shift registers become filled with data, and a latch pulse is emitted to each IC from IC1 pin 167 (THLAT).

   With this latch pulse, all the contents of the shift registers are latched to the latch registers. Thereafter, through the addition of strobes from the IC1 pins (159, 160) only black dot locations (=1) among latched data activates the driver, and the current passes to heat the emitting body causing heat emission.
   Here, the three line strobes, STB1 to STB2, impress at intervals of 9.216 msec, as required for one-line printout.
   The sequence is shown on the next page. [Moreover, for the strobe width, the thermistor value inside the thermal head is detected according to IC1 pin 207. (See **6.3.1. Block Diagram**.) Depending on that value, the strobe width is recorded in ROM (IC2).
   Accordingly, the strobe width is determined.
   When the thermal head is not used, the IC1 (170, THON) becomes low, Q8 turns OFF, Q13 turns OFF, and the +24 V power supply for the thermal head driver is not impressed to protect the IC.

Circuit Diagram
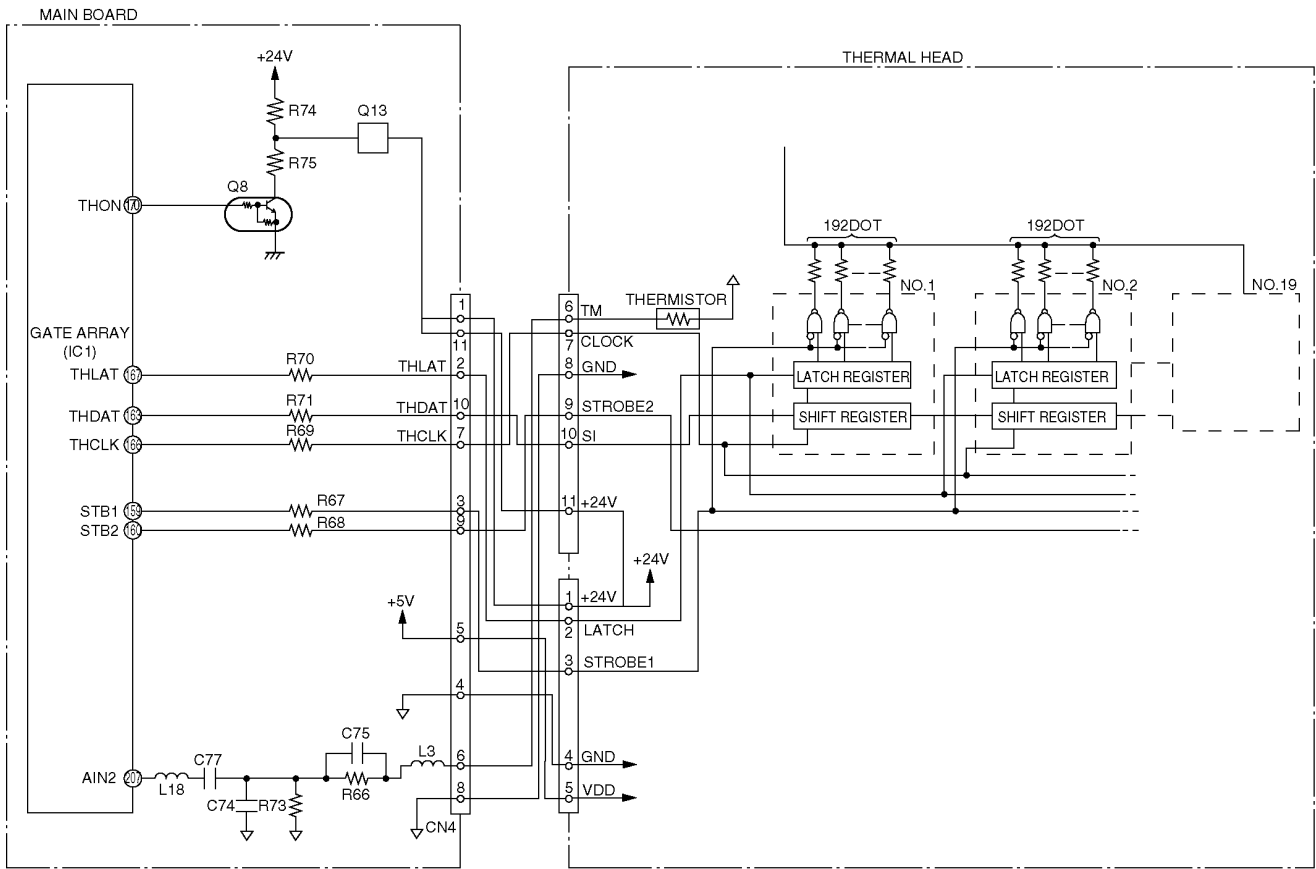
Timing Chart
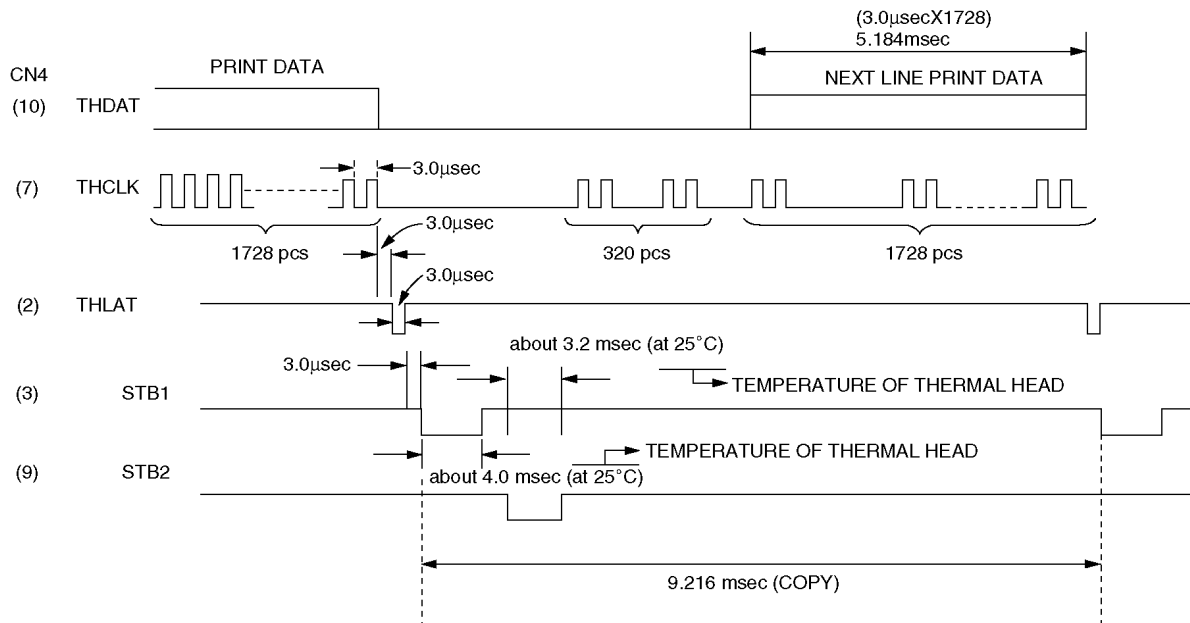
6.4.4. SCANNING BLOCK

The scanning block of this device consists of a control circuit and a contact image sensor made up of a celfoc lens array, an LED array, and photoelectric conversion elements.

Circuit Diagram
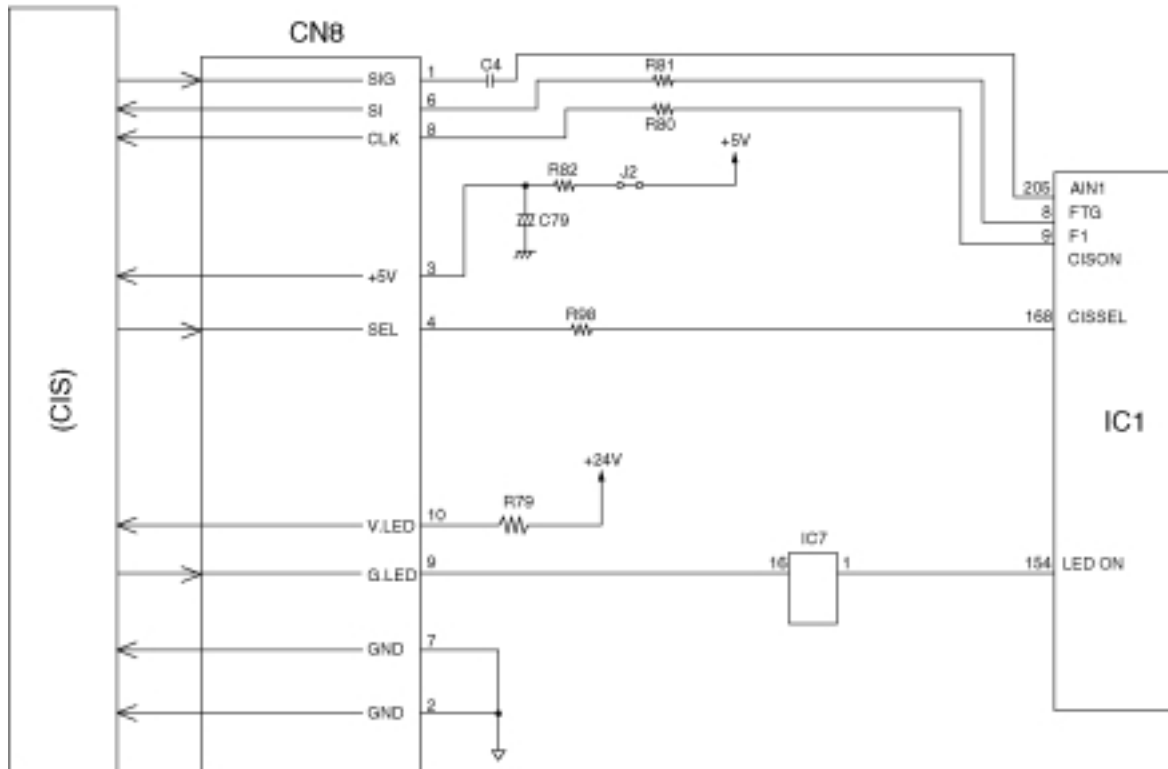
When an original is inserted and the start button pressed, pin 154 of IC1 goes to a high level and the transistor inside IC7 turns on. This applies voltage to the LED array to light it. The contact image sensor is driven by each of the FTG-F1 signals output from IC1, and the original image illuminated by the LED array undergoes photoelectric conversion to output an analog image signal (AIN). The analog image signal is input to the system LSI (IC1) on ANA1 (pin 205 of IC1) and converted into 8-bit data by the A/D converter inside IC1. Then this signal undergoes digital processing in order to obtain a high-quality image.

6.4.5. STEPPING MOTOR DRIVE CIRCUIT

1. **Function**

   One individual stepping motor is used for transmission and reception. It feeds the document or recording paper synchronized for reading or printing.

2. **Circuit Operation**

   During motor drive, gate array IC1 pin 153 becomes a high level, and Q14 and Q7 go ON as a result. +24 V is supplied to the motor coil.
   Stepping pulses are output from gate array IC1, causing driver IC7 to go ON. The motor coil is energized sequentially in 2 phase increments or 1-2 phase increments, which causes a 1-step rotation. A 1-step rotation is 0.13mm of recording paper or document paper. The timing chart is below.

Timing chart (2 Phase)   1-2. Phase (Asic T2-T5, output)
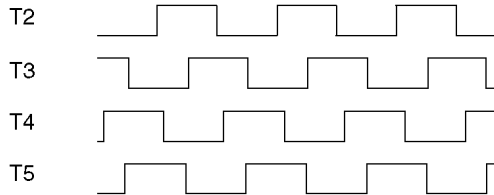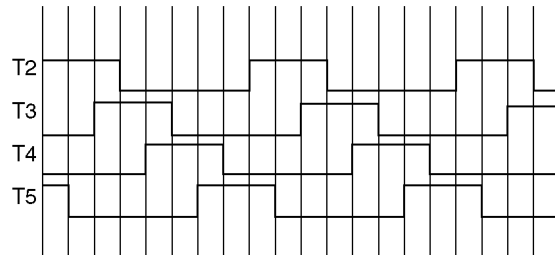
Stepping Motor Phase Pattern

Function	Mode	Phase Pattern	Speed
Copy	Fine/Half Tone	1-2	217 pps
	Super Fine	1-2	108.5 pps
FAX	STD	2	217 pps
	Fine/Half Tone	1-2	217 pps
	Super Fine	1-2	108.5 pps
——	Paper Feed	2-2	434 pps

CIrcuit Diagram
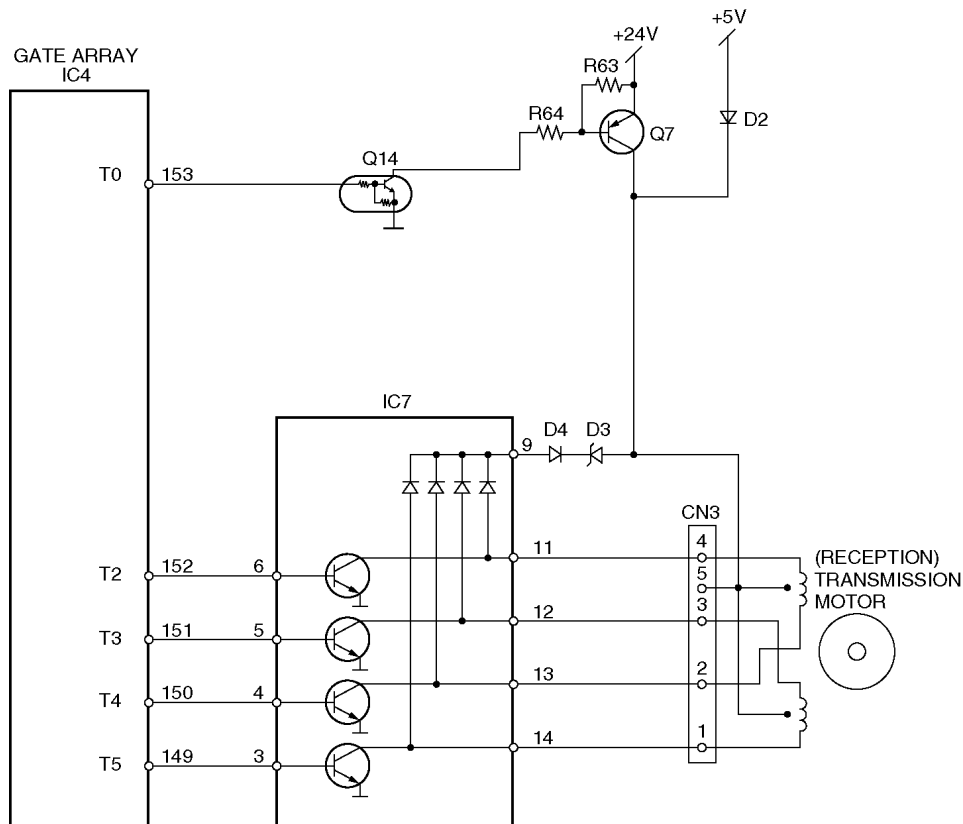
When the motor is OFF, gate array IC1 pin 153 becomes a low level and Q14 and Q7 also turns OFF. Instead of +24V, +5V is supplied through D2 so that the motor is held in place.

6.4.6. GEAR SECTION

This section shows how the motor-driven gear mechanism works in the main operations: FAX transmission, FAX reception the motor and copying.

6.4.6.1. Mode Selection

When the motor attached to the Drive Motor Gear rotates counterclockwise (CCW), Swing Gear A-2 engages the CAM and the CAM turns counterclockwise to select a mode. (See **Fig. A.**) There are three mode options controlled by the Switch: **A**: Transmitmode, **B**: Receive mode and **C**: Copy mode. In **Fig. B**, you can see which mode is selected by the position of the rib in the CAM.
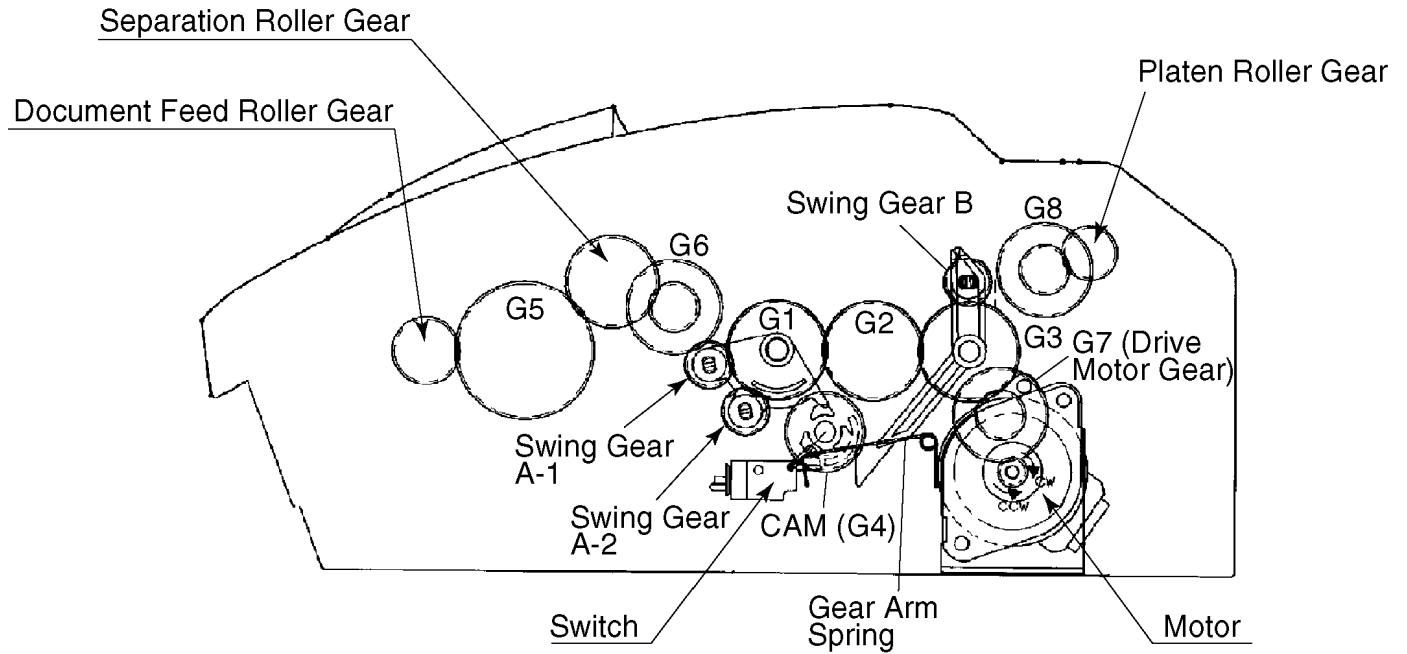
Fig. A [The operation is in the Transmit mode (A).]

A: Transmit mode   B: Receive mode   C: Copy mode
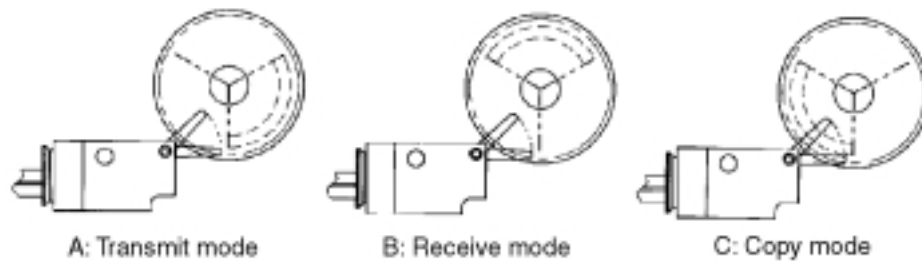
Fig. B

6.4.6.2. Mode Operation

Once a mode is selected, the Drive Motor Gear rotates clockwise (CW) and then the Swing Gear A-1 controls the mode operation.

A: Transmit mode

Swing Gear A-1 engages G6 and conveys its drive power to the Separation Roller Gear for pre-feeding documents.

B: Receive mode

Swing Gear B engages G8 and conveys its drive power to the Platen Roller Gear for printing the received data.

C: Copy mode

Swing Gear A-1 and B engage Gears 6 and 8 respectively and drive both the Separation Roller Gear and the Platen Roller Gear for feeding documents and recording paper in the copying operation.

6.4.6.3. Mechanical Movements in the Main Operations

6.4.6.3.1. Idle status

```
          ┌─────────────────┐
          │    Power ON      │
          └────────┬────────┘
                   │
    ┌──────────────▼──────────────┐
    │ The motor rotates CCW until the│
    │ Switch turns ON.             │
    └──────────────┬──────────────┘
                   │
          ┌────────▼────────┐   NO
          │ The Switch is ON ├──────────┐
          └────────┬────────┘          │
                  YES                   │
                   │          ┌─────────▼────────────────┐
                   │          │ "Call service 2" is displayed.│
                   │          └─────────┬────────────────┘
                   │◄───────────────────┘
          ┌────────▼────────┐
          │      END         │
          └─────────────────┘
```

6.4.6.3.2. Scanning

```
┌─────────────────────────────┐
│ When the document is set, in the │ ──NO──▶ See 2.3.4.7. Sensor Section
│ paper tray does the Document Sensor │
│ (PS1) turn ON ?              │
└─────────────────────────────┘
          │ YES
          ▼
┌─────────────────────────────┐
│ The motor rotates CW and the │
│ document is pre-fed.         │
└─────────────────────────────┘
          │
          ▼
┌─────────────────────────────┐
│ Press the dial key.         │
└─────────────────────────────┘
          │
          ▼
┌─────────────────────────────┐
│ Press the start key.        │
└─────────────────────────────┘
          │
          ▼
┌─────────────────────────────┐
│ Does the motor rotate CW and is the │ ──NO──▶ Error is displayed.
│ Read Position Sensor (PS2) ON?  │
└─────────────────────────────┘
          │ YES
          ▼
┌─────────────────────────────┐
│ The motor rotates CW and the document data │
│ is scanned by the Image Sensor until the │
│ Read Position Sensor (PS2) turns OFF.  │
└─────────────────────────────┘
          │
          ▼
┌─────────────────────────────┐
│ The motor rotates cow and the │
│ document is ejected.        │
└─────────────────────────────┘
          │
          ▼
┌─────────────────────────────┐
│            END              │
└─────────────────────────────┘
```

6.4.6.3.3. Printing

```
┌─────────────────────────────┐
│ Is the recording paper installed in the │
│ paper cassette properly ?   │
└─────────────────────────────┘
          │ YES
          ▼
┌─────────────────────────────┐
│ Is the data received ?      │
└─────────────────────────────┘
          │ YES
          ▼
┌─────────────────────────────┐
│ The motor rotates CCW and the │
│ CAM is set to the Receive mode (B). │
└─────────────────────────────┘
          │
          ▼
┌─────────────────────────────┐
│ The motor rotates CW and the received │
│ document is printed.        │
└─────────────────────────────┘
          │
          ▼
┌─────────────────────────────┐
│ The motor rotates CCW and the recording │
│ paper is ejected.           │
└─────────────────────────────┘
          │
          ▼
┌─────────────────────────────┐
│ The motor rotates CW and the CAM is set to │
│ the Transmit mode (A).      │
└─────────────────────────────┘
          │
          ▼
┌─────────────────────────────┐
│            END              │
└─────────────────────────────┘
```

Note:

See **6.5. SENSERS AND SWITCHES**.

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6.4.6.3.4. Copying

When the document is set in the paper tray, does the Document Sensor (PS1) turn ON ?

↓

The motor rotates cow and the document is pre-fed.

↓

Press the start key.

↓

The motor rotates cow and the Read Position Sensor (PS2) is ON.

↓

The motor rotates cow and the CAM is set to the Copy mode (C).

↓

The motor rotates cow and the document data is scanned by the Image Sensor and the recording paper is printed until the Read Position Sensor (PS2) turns OFF.

↓

The motor rotates cow and the CAM is set to the Receive mode (B).

↓

The motor rotates cow and the recording paper is ejected.

↓

The motor rotates cow and the CAM is set to the Transmit mode (A).

↓

The motor rotates cow and the document is ejected.

↓

END

6.5.   SENSORS AND SWITCHES

All of the sensor and switches are shown below.

Sensor Circuit Location	Sensor	Sensor or Switch Name	Message Error
Digital	SW3	Motor Position	————
Analog	SW1	Cover Open and Paper set	[CHECK COVER] and [OUT OF PAPER]
	SW2	Hook SW	————
Operation Panel	PS2	Document Read Position	[REMOVE DOCUMENT]
	PS1	Document	[CHECK DOCUMENT]

Sensor Locations

119
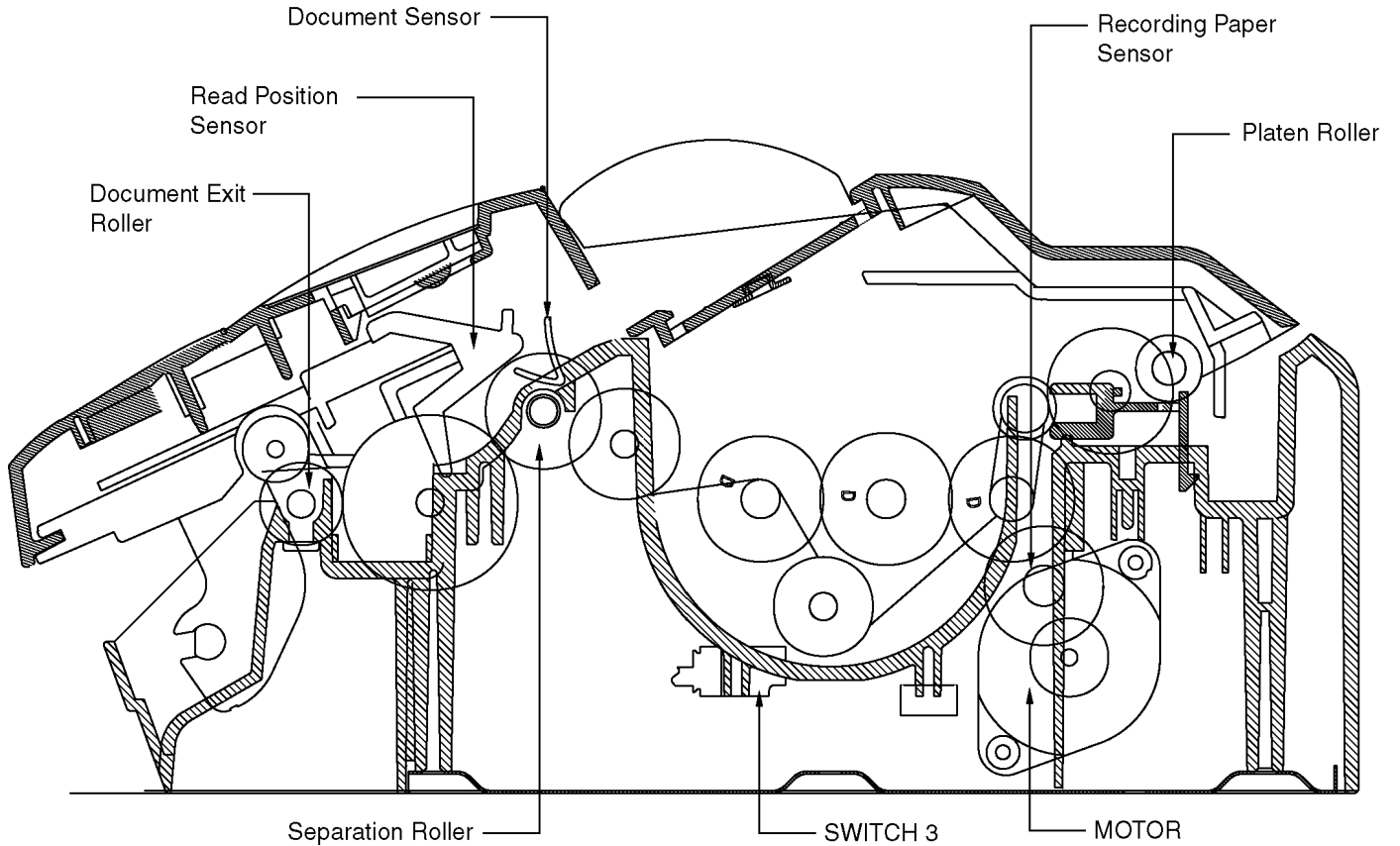
6.5.1. Motor Position Sensor

This sensor is a detection switch for recording the position of the CAM.
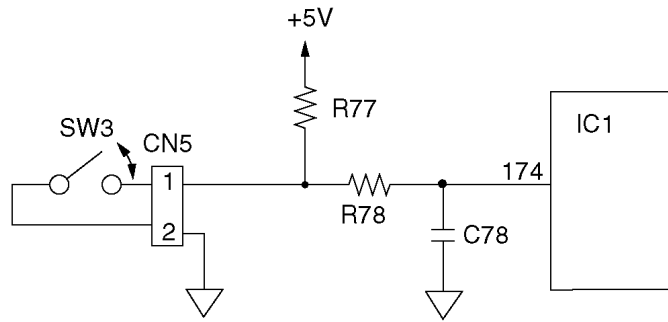
Digital Board	
	Signal (IC1-174 Pin)
Home position	Low level
Other	High level

6.5.2. Recording Paper Sensor (SW201)

When there is no recording paper, the plate is separated from the switch lever and the switch turns off.
Pin 9 of CN102 (Analog board) becomes a high level.
When there is recording paper, the plate pushes the switch lever and the switch turns ON.
Pin 9 of CN102 (Analog board) becomes a low level.
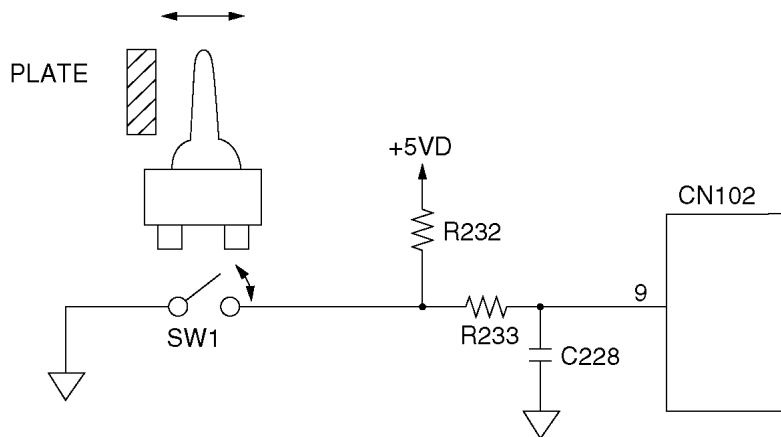
Analog Board	
	Signal (CN102-9 Pin)
Paper	Low level
No paper	High level

6.5.3. Read Position Sensor (PS2)

When a document is brought to the read position, the shelter plate passes the sensor light, the photo transistor becomes ON, and the input signal of the CN2-3 pin (Operation) becomes a low level. When there is no document at the read position, the shelter plate closes the sensor light, the photo transistor becomes OFF, and the input signal of the CN2-3 pin (Operation) becomes a high level. (When checking this sensor, CN1-8 pin, 2pin becomes low level).

Operation Board		
	Photo transistor	Signal (CN2-3 Pin)
Out of the Read Position	OFF	High level
At the Read Position	ON	Low level
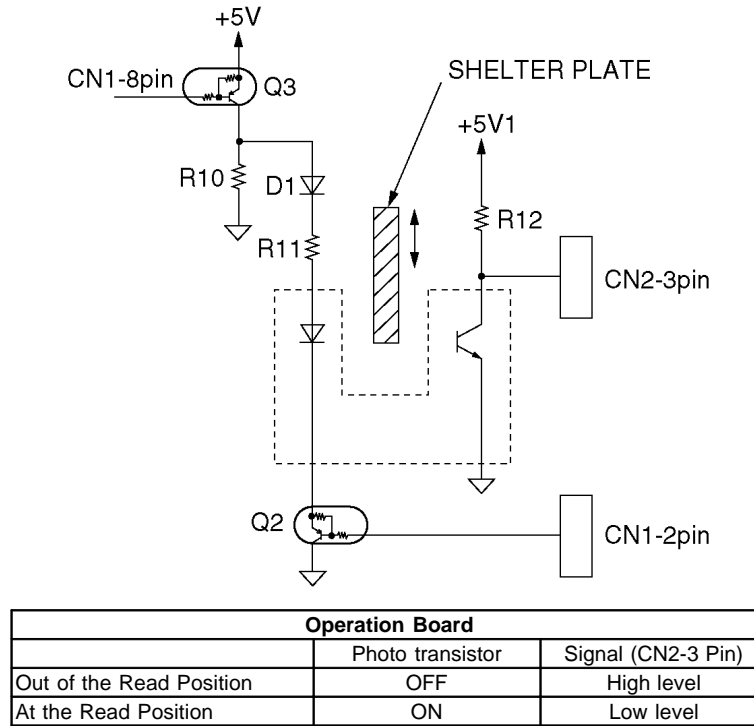
6.5.4. Document Sensor (PS1)

When a document is set, the shelter plate closes the sensor light, the photo transistor becomes OFF, and the input signal of the CN2-3 pin (Operation) becomes a high level. When there is no document, the shelter plate passes the sensor light, the photo transistor becomes ON, and the input signal of the CN2-3 pin (Operation) becomes a low level.
 (When checking this sensor, the CN1-8 pin, 3pin becomes a low level.)

Operation Board		
	Photo transistor	Signal (CN2-3 Pin)
No document	ON	Low level
Set document	OFF	High level

121
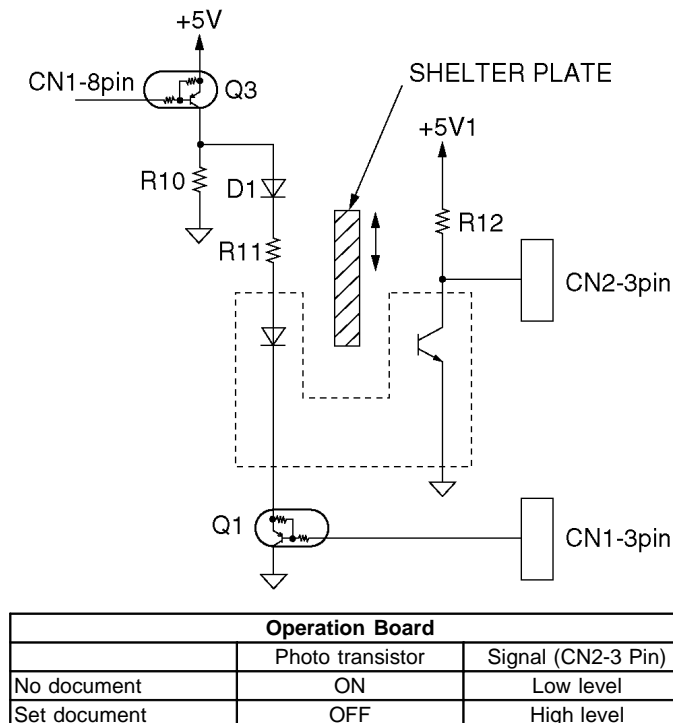
6.6. MODEM SECTION

6.6.1. FUNCTION

The unit uses a 1 chip modem (IC1), enabling it to act as an interface between the control section for FAX sending and receiving, and the telephone line. During a sending operation, the digital image signals are modulated and sent to the telephone line. During a receiving operation, the analog image signals which are received via the telephone line are demodulated and converted into digital image signals. The communication format and procedures for FAX communication are standardized by ITU-T. This 1 chip modem (IC1) has hardware which sends and detects all of the necessary signals for FAX communication and DTMF.
 It can be controlled by writing commands from the ASIC (IC1) to the register in the modem (IC1).
This modem (IC1) also sends DTMF signals, generates a call tone (from the speaker), and detects busy tones, dial tones and DTMF.

Overview of Facsimile Communication Procedures (ITU-T Recommendation):

1. **ON ITU-T (International Telecommunications´ Union.)**

   The No. XIV Group of ITU-T, one of the four permanent organizations of the International Telecommunications Uniib (ITU), investigates and make recommendations on international standards for facsimiles.

2. **Definition of Each Group**

   ・Group I (G1)

   A-4 size documents without using formats which reduce the band width of a signal sent over telephone lines.
   Determined in 1968.
    Transmission for about 6 minutes at scanning line density of 3.85 lines/mm.

   ・Group II (G2)

   Using reduction technology in the modulation/demodulation format, an A-4 size document is sent at an official scanning line density of 3.85 lines/mm for about 3 minutes.
   Methods to suppress redundancy are not used.
   Determined in 1976.

   ・Group III (G3)

   A method of suppressing redundancy in the image signal prior to modulation is used. An A-4 size document is sent with about one minute.
    Determined in 1980.

   ・Group IV (G4)

   Transmission is via the data network. A method is provided for suppressing redundancy in signals prior to transmission, and error-free reception of transmission is possible.
   The scope of these facsimile applications is not limited simply to transmission of written statements. Through symbiotic linkages with other communication methods, it can be expected to expand to include integrated services.

3. **Facsimile Call Time Series**

   As shown in the following diagram, the facsimile call time series is divided into five phases.
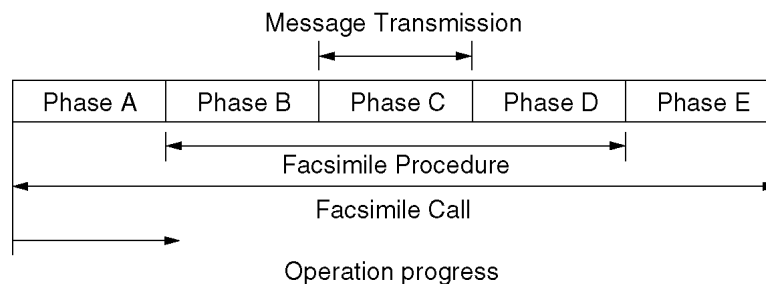
Phase A : Call setting

Call setting can be manual/automatic.

Phase B : Pre-message procedure

Phase B is a pre-processing procedure and sequence for confirming the status of the terminal, transmission route, etc. and for terminal control. It implements the terminal preparation status, determines and displays terminal constants, confirms synchronization status, etc. and prepares for transmission of facsimile messages.

Phase C : Message transmission

Phase C is the procedure for transmitting facsimile messages.

Phase D : Post message procedure

Phase D is the procedure for confirming that the message is completed and received. For continuous transmission, phase B or phase C are repeated for transmission.

Phase E : Call retrieval

Phase E is the procedure for call retrieval, that is for circuit disconnection.

4. **Concerning Transmission Time**

| Transmission Time | = | Control Time | + | Image Transmission Time | + | Hold Time |

Transmission time consists of the following.

Control time:

This is time at the start of transmission when the functions at the sending and receiving sides are confirmed, the transmission mode is established, and transmission and reception are synchronized.

Image transmission time:

This is the time required for the transmission of document contents (image data). In general, this time is recorded in the catalog, etc.

Hold time:

This is the time required after the document contents have been sent to confirm that the document was in fact sent, and to check for telephone reservations and/or the existence of continuous transmission.

5. **Facsimile Standards**

Item	Telephone Network Facsimile
	G3 Machine
Connection Control Mode	Telephone Network Signal Mode
Terminal Control Mode	T. 30 Binary
Facsimile Signal Format	Digital
Modulation Mode	PSK (V. 27 ter) or QAM (V. 29)
Transmission Speed	300 bps (Control Signal) 2400, 4800, 7200, 9600 bps (FAX Signal)
Redundancy Compression Process (Coding Mode)	1 dimension: MH Mode 2 dimension: MR Mode (K=2.4)
Resolution	Main Scan: 8 pel/mm Sub Scan: 3.85, 7.7l/mm
Line Synchronization Signal	EOL Signal
1 Line Transmission Time [ms/line]	Depends on the degree of data reduction. Minimum Value: 10, 20 Can be recognized in 40ms.

6. **Explanation of Technology**

a. **G3 Communication Signals (T. 30 Binary Process)**

For G3 facsimile communication, this is the procedure for exchanging control signals between the sending and receiving machines both before and after transmission of image signals.
Control signals at 300 bps FSK are: 1850 Hz...0, 1650Hz...1.
An example of the binary process in G3 communication is shown below.

	Transmitting Side	Receiving Side
Phase A	Document set / Dial — Dial Tone — Bell	Bell Detection
	(CNG)	
	CED	Notifies the capacity of the receiving unit (e.g. , recording paper width, transmission speed).
Phase B	FAX SW — DIS	
	Checks the performance of the sending machine (document width, transmission speed, etc.), and sets the communication mode. — DCS	Checks the receiving preparations and line condition.
	Training 1, TCF	
	CFR	Receive preparation OK
Phase C	Transmission Start — Training 2	Record Start
	Image Information / RTC	Record Stop
Phase D	Transmission End — EOP	
	MCF	Reception OK
	Information of Disconnect	
Phase E	Disconnect — DCN	Disconnect

Explanation of Signals

Control signals are comprised mainly of 8-bit identification signals and of the data signals added to them. Data signals are added to DIS and DCS signals.

Signal.....DIS (Digital Identification Signal)
Identification Signal Format.....00000001

Function:
Notifies the capacity of the receiving unit. The added data signals are as follows.

(Example)

Bit No.	DIS/DTC	DCS
1	Transmitter - T.2 operation	
2	Receiver - T.2 operation	Receiver - T.2 operation
3	T.2 IOC = 176	T.2 IOC = 176
4	Transmitter - T.3 operation	
5	Receiver - T.3 operation	Receiver - T.3 operation
6	Reserved for future T.3 operation features.	
7	Reserved for future T.3 operation features.	
8	Reserved for future T.3 operation features.	
9	Transmitter - T.4 operation	
10	Receiver - T.4 operation	Receiver - T.4 operation
11, 12 (0, 0) (0, 1) (1, 0) (1, 1)	Data signaling rate V.27 ter fall back mode V.27 ter V.29 V.27 ter and V.29	Data signaling rate 2400 bit/s, V.27 ter 4800 bit/s, V.27 ter 9600 bit/s, V.29 7200 bit/s, V.29
13	Reserved for the new modulation system.	
14	Reserved for the new modulation system.	
15	Vertical resolution = 7.7 line/mm	Vertical resolution = 7.7 line/mm
16	Two-dimensional coding capability	Two-dimensional coding

Bit No.	DIS/DTC	DCS
17, 18	Recording width capabilities	Recording width
(0, 0)	1728 picture elements along scan line length of 215 mm ± 1%	1728 picture elements along scan line length of 215 mm ± 1%
(0, 1)	1728 picture elements along scan line length of 215 mm ± 1% and 2048 picture elements along scan line length of 255 mm ± 1% and 2432 picture elements along scan line length of 303 mm ± 1%	2432 picture elements along scan line length of 303 mm ± 1%
(1, 0)	1728 picture elements along scan line length of 215 mm ± 1% and 2048 picture elements along scan line length of 255 mm ± 1%	2048 picture elements along scan line length of 255 mm ± 1%
(1, 1)	Invalid	Invalid
19, 20	Maximum recording length capability	Maximum recording length
(0, 0)	A4 (297 mm)	A4 (297 mm)
(0, 1)	Unlimited	Unlimited
(1, 0)	A4 (297 mm) and B4 (364 mm)	B4 (364 mm)
(1, 1)	Invalid	Invalid

Signal.....DCS (Digital Command Signal)

Identification Signal Format.....X1000001

Function:

Notifies the capacity of the receiving machine obtained at DIS and announces the transmission mode of the sender. The added data signals are as follows.

(Example)

Bit No.	DIS/DTC	Standard setting	DCS
21, 22, 23	Minimum scan line time capability of the receiver		Minimum scan line time
(0, 0, 0)	20 ms at 3.85 l/mm: T7.7 = T3.85		20 ms
(0, 0, 1)	40 ms at 3.85 l/mm: T7.7 = T3.85		40 ms
(0, 1, 0)	10 ms at 3.85 l/mm: T7.7 = T3.85		10 ms
(1, 0, 0)	5 ms at 3.85 l/mm: T7.7 = T3.85		5 ms
(0, 1, 1)	10 ms at 3.85 l/mm: T7.7 = 1/2 T3.85		
(1, 1, 0)	20 ms at 3.85 l/mm: T7.7 = 1/2 T3.85		
(1, 0, 1)	40 ms at 3.85 l/mm: T7.7 = 1/2 T3.85		
(1, 1, 1)	0 ms at 3.85 l/mm: T7.7 = T3.85		0 ms
24	Extend field	1	Extend field
25	2400 bit/s handshaking	0	2400 bit/s handshaking
26	Uncompressed mode	0	Uncompressed mode
27	Error correction mode	0	Error correction mode
28	Set to "0".	0	Frame size 0 = 256 octets 1 = 64 octets
29	Error limiting mode	0	Error limiting mode
30	Reserved for G4 capability on PSTN	0	Reserved for G4 capability on PSTN
31	Unassigned	0	
32	Extend field	1	Extend field
33	Validity of bits 17, 18	0	Recording width
(0)	Bits 17, 18 are valid		Recording width indicated by bits 17, 18
(1)	Bits 17, 18 are invalid		Recording width indicated by this field bit information
34	Recording width capability 1216 picture elements along scan line length of 151 ± mm 1%	0	Middle 1216 elements of 1728 picture elements
35	Recording width capability 864 picture elements along scan line length of 107 ± mm 1%	0	Middle 864 elements of 1728 picture elements
36	Recording width capability 1728 picture elements along scan line length of 151 ± mm 1%	0	Invalid
37	Recording width capability 1728 picture elements along scan line length of 107 ± mm 1%	0	Invalid
38	Reserved for future recording width capabilities.	0	
39	Reserved for future recording width capabilities.	0	
40	Extend field	1	Extend field
41	Semi super time / mm	1	
42	Semi super time / mm	0	
43	Super time	0	
44	Inch	0	
45	mm	1	
46	MSC/SF	0	
47	Select Polling	0	
48	EXT	0	

Note 1 - Standard facsimile units conforming to T.2 must have the following capability: Index of cooperation (IOC)=264.

Note 2 - Standard facsimile units conforming to T.3 must have the following capability: Index of cooperation (IOC)=264.

Note 3 - Standard facsimile units conforming to T.4 must have the following capability: Paper length=297 mm.

Signal	Identification Signal Format	Function
Training 1	——————————	A fixed pattern is transmitted to the receiving side at a speed (2400 to 9600 bps) designated by DCS, and the receiving side optimizes the automatic equalizer, etc., according to this signal.
TCF (Training Check)	——————————	Sends 0 continuously for 1.5 seconds at the same speed as the training signal.
CFR (Confirmation to Receive)	X0100001	Notifies the sending side that TCF has been properly received. If TCF is not properly received, FTT (Failure To Train) X0100010 is relayed to the sender. The sender then reduces the transmission speed by one stage and initiates training once again.
Training 2	——————————	Used for reconfirming the receiving side like training 1.
Image Signal	Refer to the next page.	——————————
RTC (Return to Control)	——————————	Sends 12 bits (0...01 × 6 times) to the receiver at the same speed as the image signal and notifies completion of transmission of the first sheet.
EOP (End of Procedure)	X1110100	End of one communication
MCF (Message Confirmation)	X0110001	End of 1 page reception
DCN (Disconnect)	X1011111	Phase E starts.
MPS (Multi-Page Signal)	X1110010	Completion of transmission of 1 page. If there are still more documents to be sent, they are output instead of EOP. After MCF reception, the sender transmits an image signal of the second sheet.
PRI-EOP (Procedural Interrupt-EOP)	X1111100	If there is an operator call from the sender, it is output after RTC.
PIP (Procedural Interrupt Positive)	X0110101	This is output when an operator call is received.

b. Redundancy Compression Process Coding Mode

This unit uses one-dimensional MH format.

Modified Huffman (MH) Code		
Run length	Code for White Line	Code for Black Line
0	00110101	000011011
1	000111	010
2	0111	11
3	1000	10
4	1011	011
5	1100	0011
6	1110	0010
7	1111	00011
8	10011	000101
9	10100	000100
10	00111	0000100
11	01000	0000101
12	001000	0000111
13	000011	00000100
14	110100	00000111
15	110101	000011000
16	101010	0000010111
17	101011	0000011000
18	0100111	0000001000

(a) Document

Basic Facsimile Technique

(b) Part of document

Facsimile

(c) Run length and image signals equivalent to (b)

Black 4   2   4   2   8   3
White
15   12   16   18   13

(d) Codification of (c) according to MH formula

00110111101010   011   110101   11   001000   011   101010
(White 400)   (Black 4)   (White 15)   (Black 2) (White 12) (Black 4)   (White 16)

11   0100111   000101   000011   10
(Black 2)   (White 18)   (Black 8)   (White 13)   (Black 3)

(c) Total bit number before MH codification (497 bit)
(d) Total bit number after MH codification (63 bit)

6.6.2. MODEM CIRCUIT OPERATION

The ASIC (IC1) has all the hardware satisfying the ITU-T standards mentioned previously.

The modem is included in IC1. The signal communicates with the TEL line through the analog front end IC (IC5) of digital/analog, analog/digital convertor. The modem in IC1 is operated using the 20.736 MHz (x2) clock.

1. **Facsimile Transmission/DTMF Line Send**

   The digital image data on the data bus is modulated in the modem (IC1), and sent to analog front end (IC5) as the digital data, then it is converted to the analog signal there. Passing through IC9 and IC6, the signal is sent to NCU section.

   [IC1 → IC5 → IC5(3) → C48 → R37 → R38 → IC9 (2) → IC9 (1) → C53 → IC6 (2) → IC6 (1) → C58 → R49 → IC9 (6) → IC9 (7) → CN10 (1)] → CN202 (1) → C106 → R103 → R102 → T101 → C8 → Q4 (C) → Q4 (E) → D1 → TEL LINE

   [ ]: Digital section

2. **Facsimile Reception**

   The analog image data which is received from the telephone line passes through the NCU section and enters pin 15 of the analog front end (IC5). The signals that enter pin 15 of the analog front end (IC5) convert the analog signals to the digital signals, then the data is sent to the modem (IC1).

   TEL LINE → D1 → Q4 (E) → Q4 (C) → C8 → T101 → R104 → C107 → R112 → IC101 (6) → IC101 (7) → C127 → IC103 (11) → IC103 (10) → CN102 (10) → [CN9 (10) → IC6 (10) → IC6 (11) → R33 → C43 → IC5 (15) → IC5 → IC1]

   [ ]: Digital section

3. **DTMF Transmission**

   The DTMF signal generated in the ASIC (IC1) is sent to the analog front end (IC5) to perform the digital/analog conversion, then output from pin 3 of IC5, and is then sent to the circuit on the same route as used for facsimile transmission.

   (DTMF Monitor Tone)

   [IC1 → IC5 → IC5(3) → C48 → R37 → R38 → IC9 (2) → IC9 (1) → C54 → R44 → IC8 (2) → IC8 (1) → C27 → R13 → IC1 (62) → IC1 (63) →C62 → IC8 (5) → IC8 (7) → C67 → CN10 (9)] → CN202 (9) → R122 → IC102 (4) → IC102 (5) → SPEAKER

   [ ]: Digital section

4. **Call Tone Transmission**

   This is the call signal which is generated in the ASIC (IC1) and sent to the speaker.

   [IC1 (59) → R28 → C45 → R35 → IC8 (2) → IC8 (1) → C27 → R13 → IC1 (62) → IC1 (63) → C62 → IC8 (5) → IC8 (7) → C67 → CN10 (9)] → CN202 (9) → R122 → IC102 (4) → IC102 (5) → SPEAKER

   [ ]: Digital section

5. **Busy/Dial Tone Detection**

   The path is the same as FAX receiving.
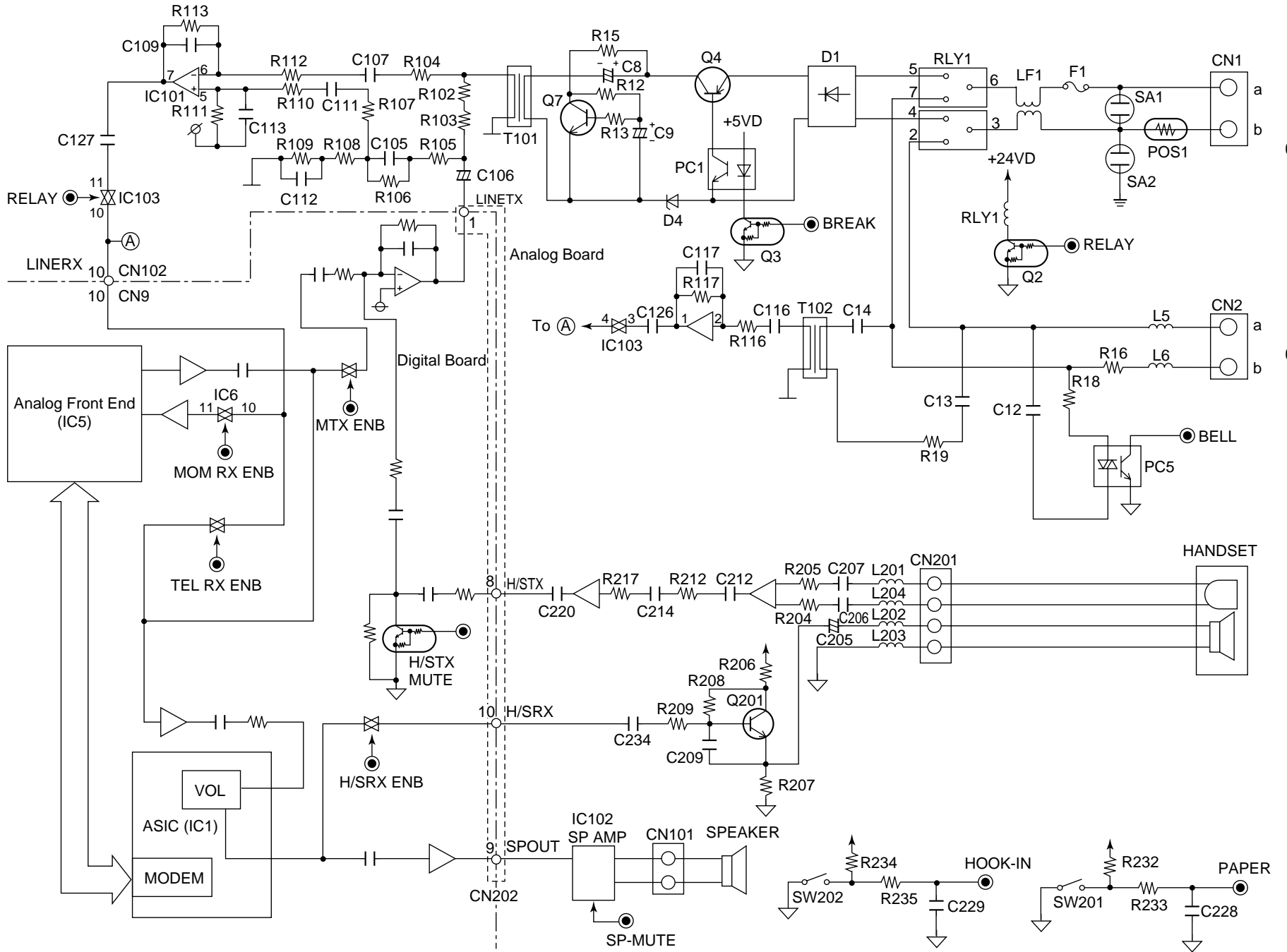
6.8. NCU SECTION

6.8.1. GENERAL

This section is the interface between the telephone line and external telephone. It is composed of an EXT. TEL Line relay (RLY1), bell detection circuit, EXT TEL selection circuit, pulse dialing circuit, line amplifier, sidetone circuits and multiplexer.

6.8.2. Line Relay (RLY1)

1. **Circuit Operation**

   Normally, this relay switches to the external telephone side (Break) and switches to the open side (make) when the unit starts facsimile communication.

   [IC1 (99) High Level → CN9 (8)] → CN102 (8) → Q2 ON → RLY1 (make)

6.8.3. BELL DETECTION CIRCUIT

1. **Circuit Operation**

   The signal waveform for each section is indicated below. The signal (low level section) input to pin 56 of ASIC IC1 on the digital board is read.

   Between the a and b — 48V — about 150V

   Between PC5 (1) and (2) — 1.5V 0V 1.5V

   PC5 (4) /Gate Array IC1 (56) — 5V
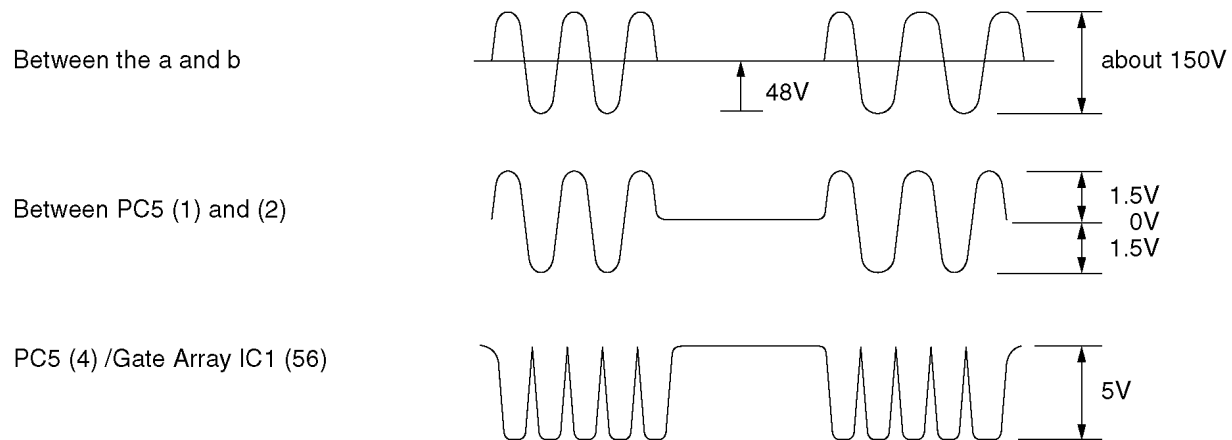
   TEL LINE → PC5 (1, 2 - 4) → PC102(6) → [CN9(6) → R19 → IC1(56)]

6.8.4. PULSE DIALIG

[IC1 (28) High Level → CN10 (4)] → CN202 (4) → Q3 ON → PC1 ON (make)

6.8.5. LINE AMPLIFIER AND SIDE TONE CIRCUITS

1. **Circuit Operation**

   The reception signal received as output from line transformer T101 is given as input to R104, C107, R112, and IC101 (8).
   Then it is input to the reception system at an amplifier gain of 5.9 dB from pin (7).
   The transmission signal is input from CN202 pin (1), and output to the TEL line through C106, R103, R102 and T101. Without
   a side tone circuit, the transmission signal would return to the reception amplifier via C106. Here, the signal output from CN202
   pin (1) passes through R105, R106, R107, C111 and R110, and enters the amplifier IC101 pin (5). This is used to cancel the
   return portion of the transmission signal. This is the side tone circuit.

```
Transmission Signal: CN202(1) → C106 ──────────→ R103 → R102 ─→ T101 → TEL LINE                          (Side Tone)
                                             ↓
                                           R105
                                             ↓
                                           R106
                                             ↓
                                           R107
                                             ↓
                                           C111
                                             ↓
                                           R110
                                             └────────┐
                                                      ↓
Reception Signal: TEL LINE → T101 → R104 → C107 → R112 → IC101 (5, 6-7) → C127 → IC103(11, 10) → CN102(10)
```
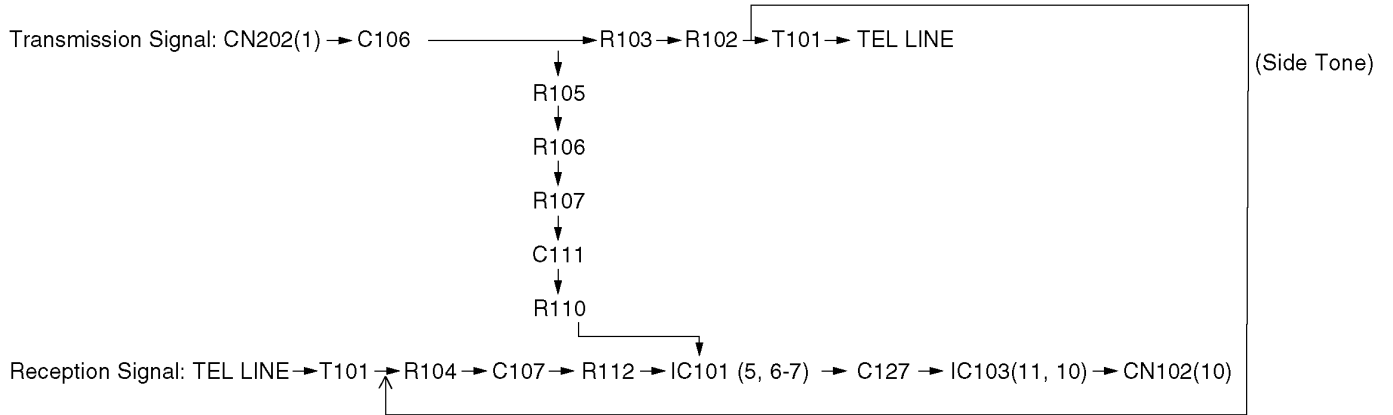
6.9. ITS (Integrated telephone System) and MONITOR SECTION

6.9.1. GENERAL

During the monitor operation, the speaker output passes through the power amplifier (IC102) [Analog board].
The DTMF signal is output from the modem (IC1: digital board). The alarm tone, the key tone, bell tone, and beep are output from gate array IC1 (digital board). During a pulse dial operation, the monitor tone is output from gate array IC1.

6.9.2. MONITOR CIRCUIT

1. **Function**

   This is the function when you are not holding the handset and can hear the caller´s voice from the line.

2. **Circuit Operation**

   (Monitor Signal Path)

   TEL LINE → D1 → Q4 (E) → Q4 (C) → C8 → T101 → R104 → C107 → R112 → IC101 (6) → IC101(7) → C127 →
   → IC103 (11) → IC103 (10) → CN102 (10) → [CN9 (10) → IC6 (3) → IC6 (4) → C52 → R42 → IC8 (2) → IC8 (1) →
   → C27 → R13 → IC1 (62) → IC1 (63) → C62 → IC8 (5) → IC8 (7) → C67 → CN10 (9)] → CN202 (9) → R122 →
   → IC102 (4) ⌐ IC102 (5) ⌐ SPEAKER
                 └ IC102 (8) ┘

6.9.3. HANDSET CIRCUIT

1. **Transmission signal**

   HANDSET MIC CN201 (1, 4) ⌐ L204 → C206 → R204 → IC201 (6) ──── ⌐ IC201 (7)
                             └ L201 → C207 → R205 → IC201 (5) ┘
   C212 → R212 → C214 → R217 → IC201 (2) → IC201 (1) → C219 → C220 → R225 → CN202 (8) → [CN10 (8) →
   R62 → C66 → C60 → R51 → IC9 (6) → IC9 (7) → CN10 (1)] → CN202 (1) → C106 → R103 → R102 → T101 →
   C8 → Q4 (C) → Q4 (E) → D1 → TEL LINE

2. **Reception Signal**

   TEL LINE → D1 → Q4 (E) → Q4 (C) → C8 → T101 → R104 → C107 → R112 → IC101 (6) → IC101 (7) → C127 →
   IC103 (11) → IC103 (10) → CN102 (10) → [CN9 (10) → IC6 (3) → IC6 (4) → C52 → R42 → IC8 (2) → IC8 (1) → C27 →
   R13 → IC1 (62) → IC1 (63) → C62 → IC8 (5) → IC8 (7) → R60 → C63 → IC6 (8) → IC6 (9) → C65 → CN10 (10)] →
   CN202 (10) → J402 → C234 → R209 → Q201 (B) → Q201 (E) → C205 → L202 → HANDSET SPEAKER

6.9.4. MONITOR CIRCUIT

1. **DTMF Monitor**

   (Monitor)

   [IC1 → IC5 → IC5 (3) → C48 → R37 → R38 → IC9 (2) → IC9 (1) → C54 → R44 → IC8 (2) → IC8 (1) → C27 → R13 →
   → IC1 (62) → IC1 (63) → C62 → IC8 (5) → IC8 (7) → C67 → CN10 (9)] → CN202 (9) → R122 → IC102 (4) →
   ⌐ IC102 (5) ⌐ SPEAKE
   └ IC102 (8) ┘

   (Handset)
   [IC1 → IC5 → IC5 (3) → C48 → R37 → R38 → IC9 (2) → IC9 (1) → C54 → R44 → IC8 (2) → IC8 (1) → C27 →
   R13 → IC1 (62) → IC1 (63) → C62 → IC8 (5) → IC8 (7) → R60 → C63 → IC6 (8) → IC6 (9) → C65 → CN10 (10)] →
   CN202 (10) → J402 → C234 → R209 → Q201 (B) → Q201 (E) → C205 → L202 → HANDSET SPEAKER

2. **Alarm/Beep/Key tone/Bell**

   [IC1 (59) → R28 → C45 → R35 → IC8 (2) → IC8 (1) → C27 → R13 → IC1 (62) → IC1 (63) → C62 → IC8 (5) → IC8 (7) →
   C67 → CN10 (9)] → CN202 (9) → R122 → IC102 (4) → IC102 (5) → SPEAKER

3. **Dummy Ring Back Tone**

   Same with the modem signal transmission.

6.10. EXT. TEL

EXT. TEL JACK is provided for the external TEL connection.
Connect the telephone to the EXT. TEL JACK. Because the unit (FT21) has the priority, EXT. TEL is disconnected when the unit is OFF-HOOK.

1. **EXT. TEL DC LOOP**

   (Signal Path)
   b → POS1 → LF1 → RLY1 (3) → RLY1 (2) → L5 → EXT.TEL → L6 → RLY1 (7) → RLY1 (6) → LF1 → F1 → a

2. **REMOTE RECEIVING**

   This is the parallel connection DTMF signal for the TEL or EXT. TEL mode between T and R. When the other party is a FAX, the unit changes to FAX receiving.

   (Signal Path)
   CN2 ┬→ L6 → R16 → R20 → C14 ┬→ T102 → C116 → R116 →
       └→ L5 → C13 → R19 ─────┘
   IC101 (2) → IC101 (1) → C126 → IC103 (3) → IC103 (4) → CN102 (10) → [CN9 (10) → IC6 (10) → IC6 (11) → R33 → C43 → IC5 (15) → IC5 → IC1
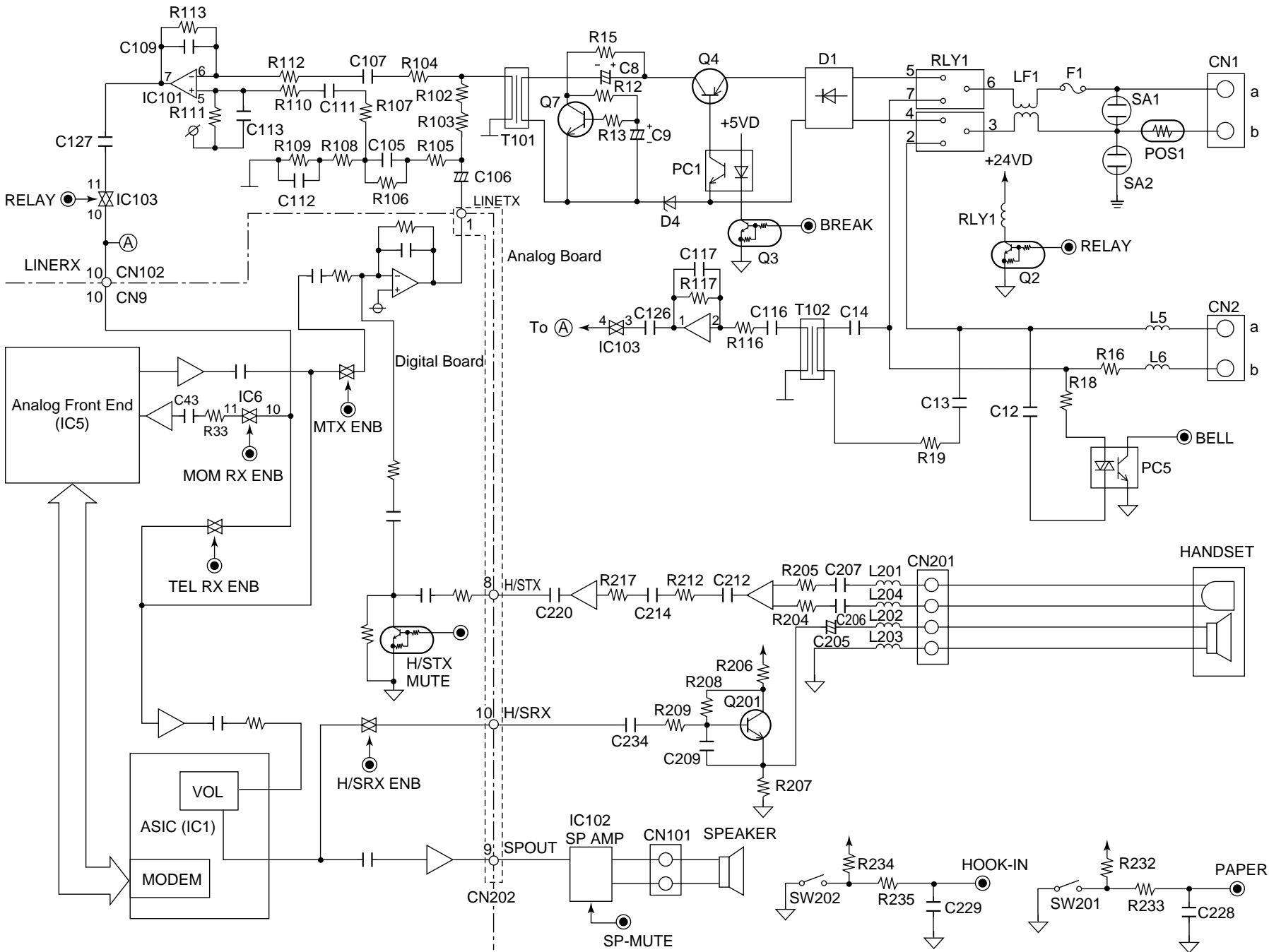
6.11. OPERATION PANEL

The unit consists of an LCD (Liquid crystal display), KEYs, photo interrupters (sensor), and analog switches (for key scan).
The key scan (analog switch control, reading), sensor detection (sensor control, reading) and LCD control are all controlled by I/O of ASIC (IC1) on the digital board.
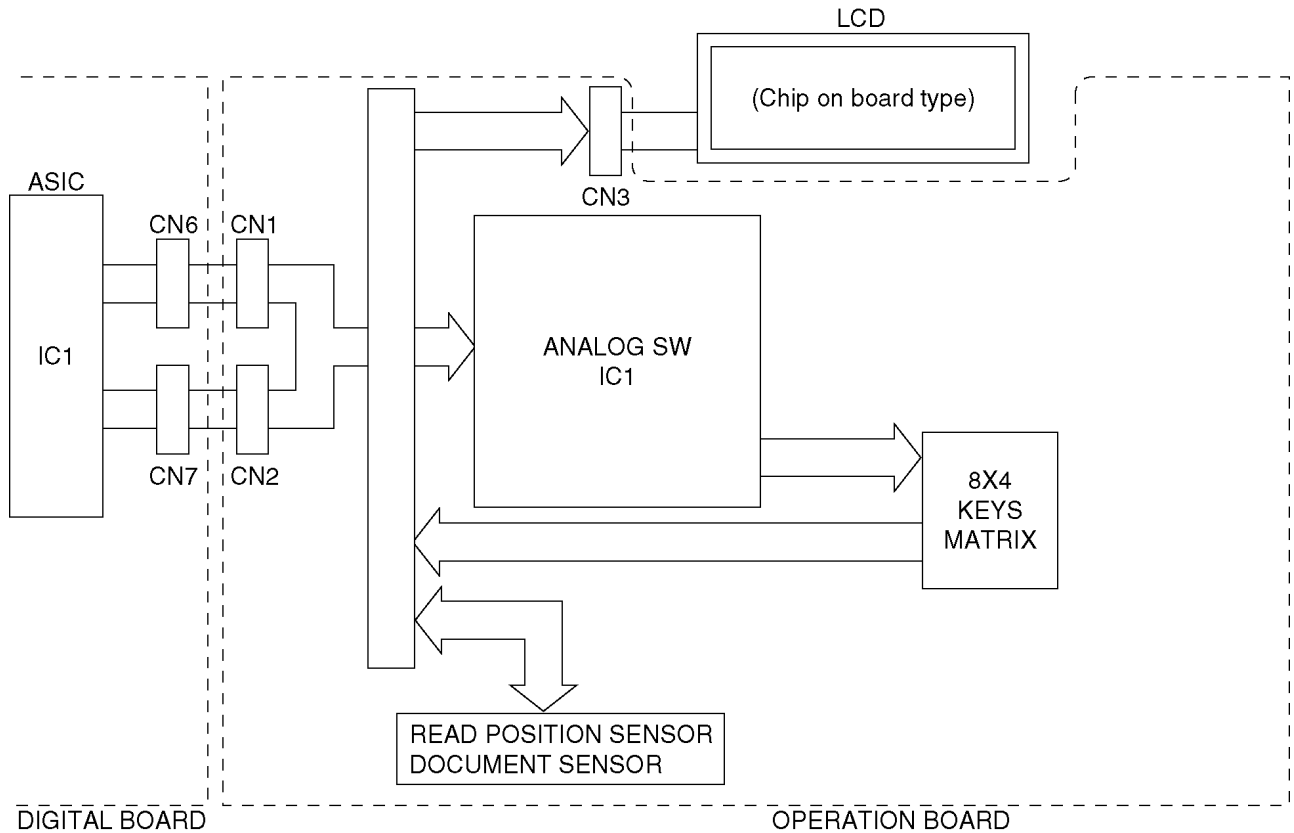
Fig. a

6.11.1. KEY SCAN

When CN1(8) (OPSEL) is "H", the analog switch (IC1) is available. The "KLATCH", "KSCLK" and "KTXD" control the analog switch (IC1) to read at KIN0~3.

Analog Switch (IC1) Control

	0	1	2	3	4	5	6	7
KLATCH (A)	L	H	L	H	L	H	L	H
KSCLK (B)	L	L	H	H	L	L	H	H
ktxd (C)	L	L	L	L	H	H	H	H

Key Matrix

	0	1	2	3	4	5	6	7
KIN0	MONITOR (SW7)	1 (SW6)	FUNCTION 3 (SW5)	STOP (SW8)		RESOLUTION (SW1)	0 (SW3)	FLASH (SW2)
KIN1	✳ (SW14)	8 (SW13)	VOLUME LOW (SW12)	MODE (SW15)	DIRECTORY (SW11)		9 (SW10)	
KIN2	4 (SW22)	2 (SW21)	LOWER (SW20)		FUNCTION 1 (SW19)	HELP (SW16)	6 (SW18)	REDIAL/ PAUSE (SW17)
KIN3	7 (SW29)	5 (SW28)	VOLUME HIGH (SW27)	START/ COPY/SET (SW30)	FUNCTION 2 (SW26)	RECEIVE MODE (SW23)	3 (SW25)	# (SW24)

6.11.2. SENSOR DETECTION

When CN1(8) (OPSEL) is "L", the detection of the document sensor and read start position sensor are available.

6.11.3. LCD CONTROL

"KTXD", "KSCLK", "KLATCH" and "KSTART" are sent as D4~D7 to control the LCD.
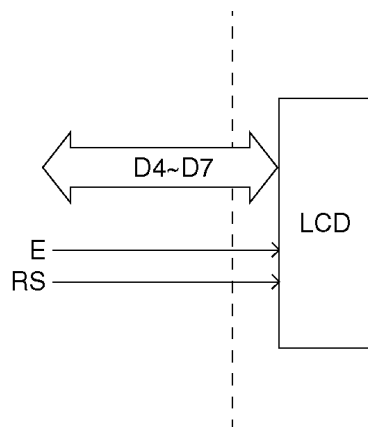
6.12. POWER SUPPLY BOARD SECTION

This power supply board uses the switching regulator method.

Block Diagram
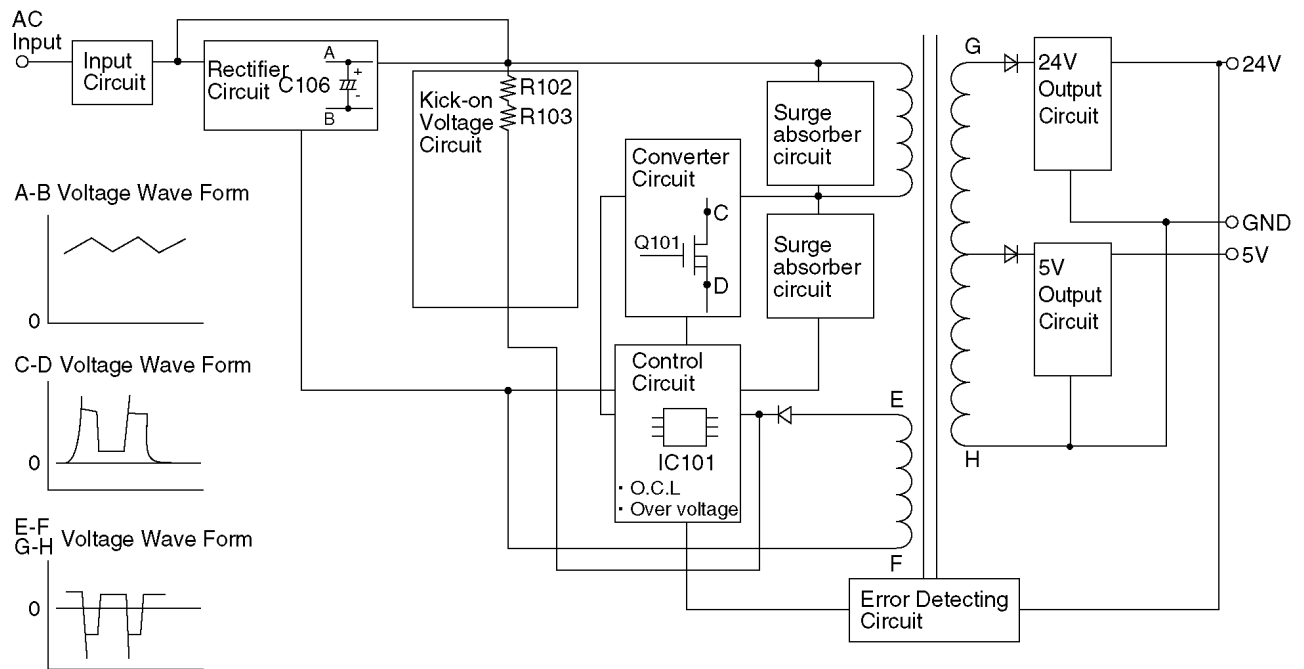
[Input Circuit]

The input current goes into the input rectifier circuit through the filter circuit. The filter circuit decreases the noise voltage and the noise electric field strength.

[Rectifier Circuit]

The input current is rectified by D101,D102,D103 and D104 and charges C106 to make DC voltage. Then it supplies power to the converter circuit.

[Kick-on voltage circuit]

Bias is applied to the Q101 gate via this circuit when the AC power is turned on and Q101 begins operating.
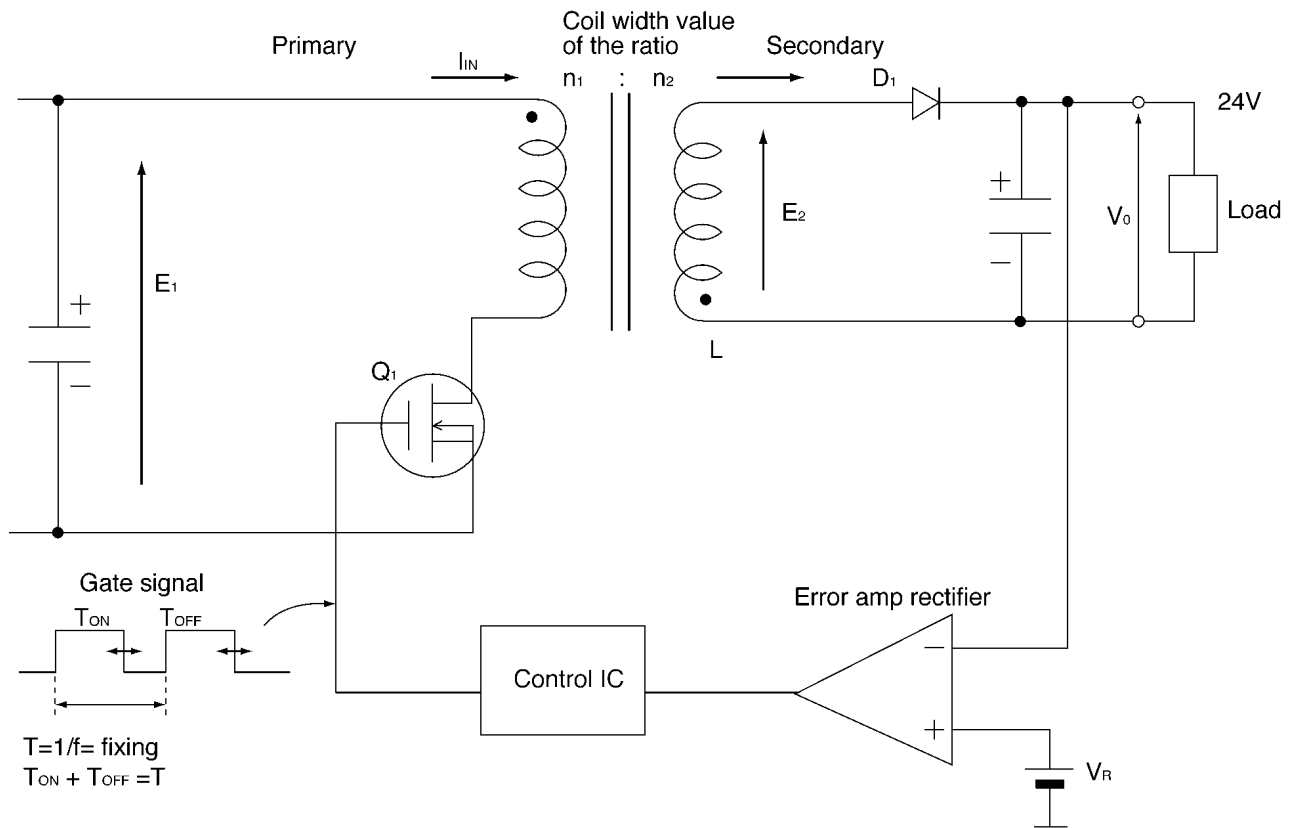
The following is an overview of how the power supply unit is controlled.

The control method of this power supply unit is pulse width modulation.

When Q_1 is ON, the energy is charged in the transformer primary coil according to E_1. When Q_1 is OFF, the energy is output from the secondary transformer as follows.

$L \rightarrow D_1 \rightarrow Load \rightarrow L$

Then the power is supplied to the Load. When Q_1 is ON, power is not output from the secondary side. The output voltage is fed back in the control IC according to the error amp rectifier. Then depending on how T_{ON} is controlled, stabilization occurs. Also, when the current load becomes too large, in order to decrease the voltage output, the increase in τ is controlled and the output voltage is stabilized.

Therefore, basically the timing: Ton/Toff of Q1 controls the output voltage.

Output/Input voltage value of ratio

138
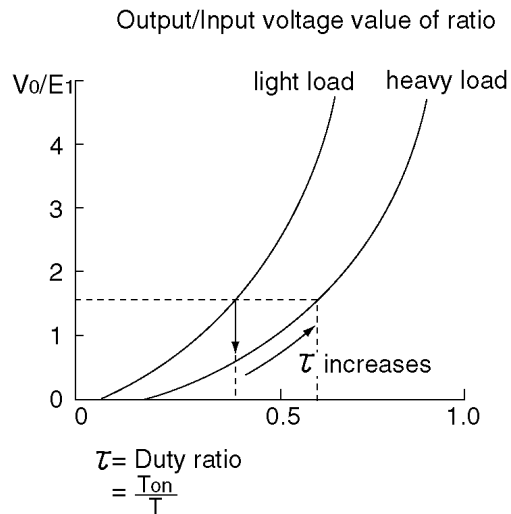
[Surge Absorber Circuit]

This circuit is for absorbing surge voltage generated by the transformer.

[Control Circuit and Detecting Circuit]

The control circuit amplifies the output with increased voltage detected in the error detecting circuit. Then it drives the main transistor.

In this power supply, the duty ratio is defined by changing the ON period of the main transistor.

This is shown as follows.

When the output voltage of the 24V circuit increases, the current of the photo coupler PC101 increases, the pulse width of the output control IC becomes narrower and the ON period of Q101 becomes shorter.

[Over Current Limiter (O.C.L)]

The highest drain current (Q101) is limited by a limiter circuit (IC101) of 24V. The 24V output is limited by this circuit.

[Over Voltage Circuit]

If the 24V output increases because the error detecting circuit or control circuit is broken, IC101 will recognize this signal and output becomes 0V.

Dummy load method (to quickly check the power supply output)

Refer to **2.3.4.5. Power Supply Board Section**.

7 FOR THE SCHEMATIC DIAGRAMS

Note:

1. DC voltage measurements are taken with an oscilloscope or a tester with a ground.

2. The schematic diagrams and circuit board may be modified at any time with the development of new technology.
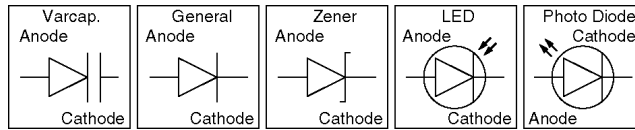
Varcap.	General	Zener	LED	Photo Diode
Anode	Anode	Anode	Anode	Cathode
Cathode	Cathode	Cathode	Cathode	Anode

Important safety notice
Components identified by ⚠ mark have special characteristics important for safety. When replacing any of these components, use only the manufacturer's specified parts.

8 PRINTED CIRCUIT BOARD

8.1. PRINTED CIRCUIT BOARD (DIGITAL BOARD): COMPONENT VIEW

PFUP1183ZA
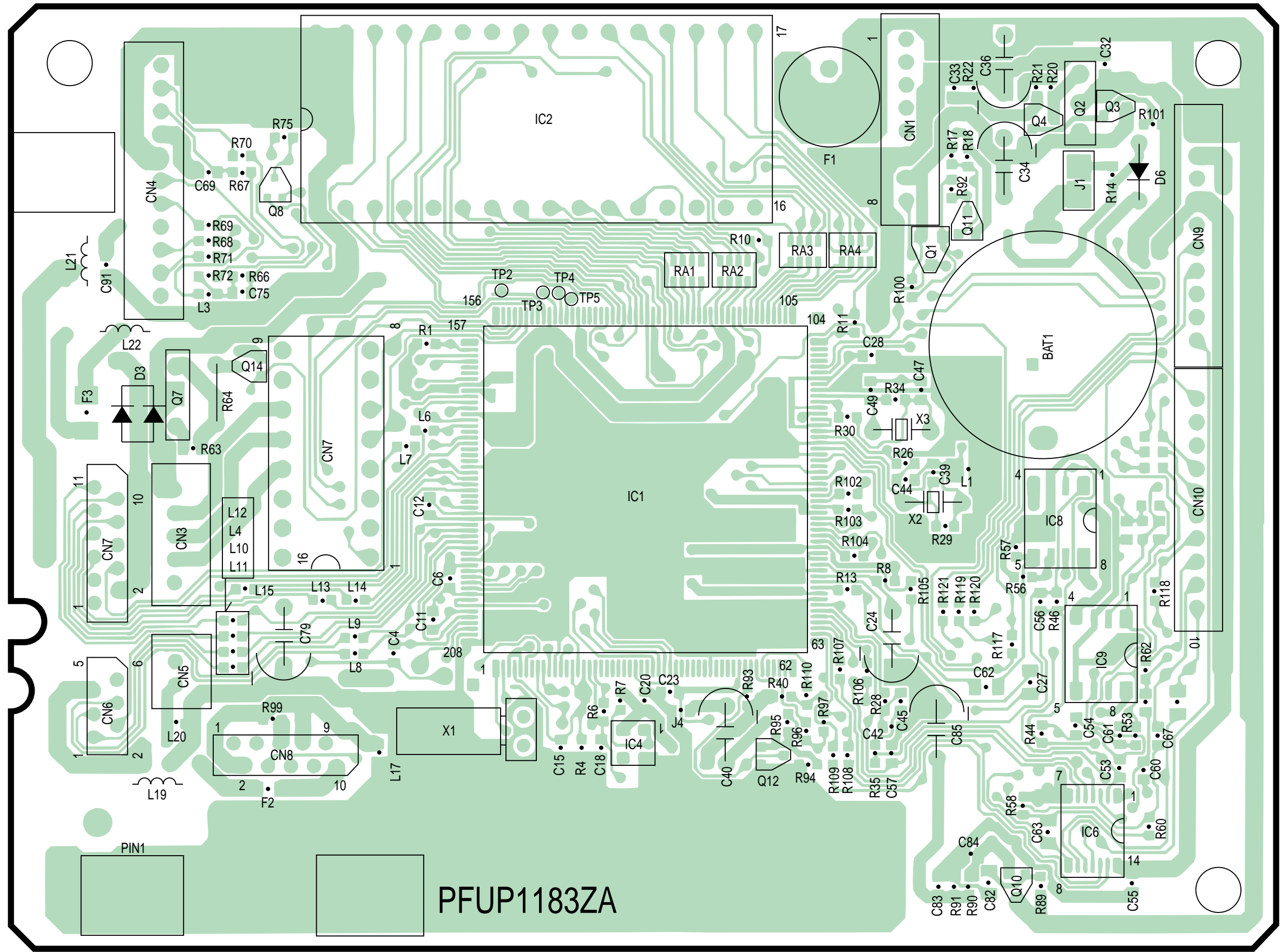
8.2. PRINTED CIRCUIT BOARD (DIGITAL BOARD): BOTTOM VIEW

PFUP1183ZA
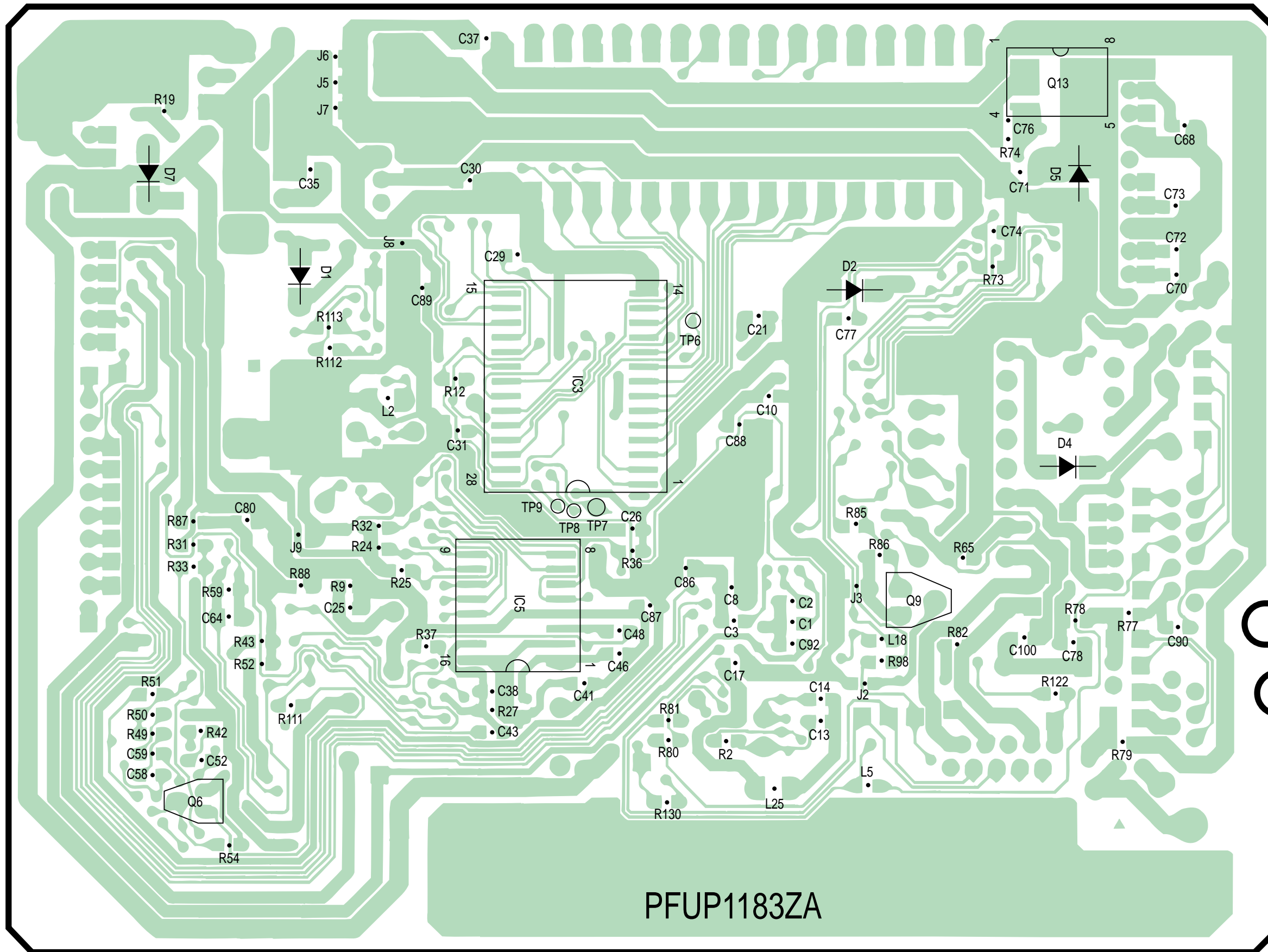
8.3. PRINTED CIRCUIT BOARD (ANALOG BOARD): COMPONENT VIEW

143

PFUP1182ZA
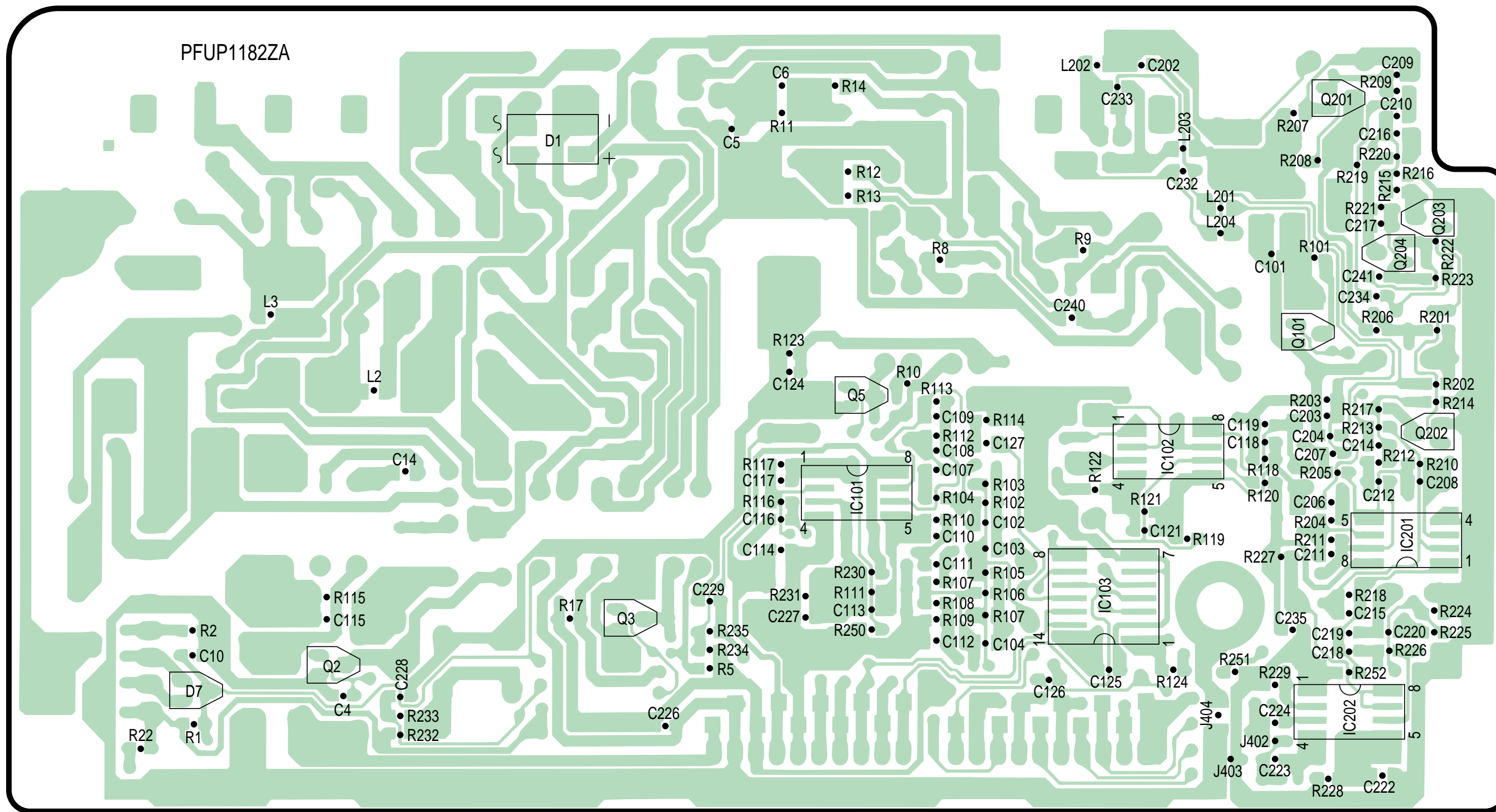
8.5.   PRINTED CIRCUIT BOARD (SWITCHING POWER SUPPLY)

(COMPONENT VIEW)
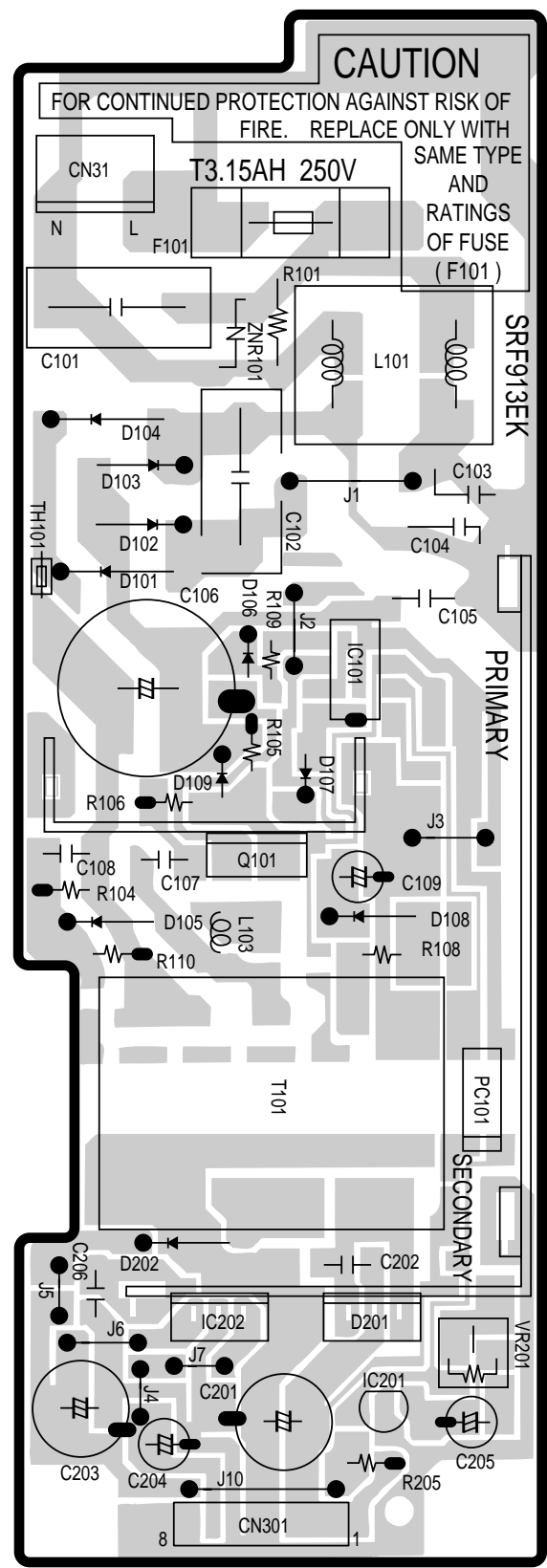
(BOTTOM VIEW)
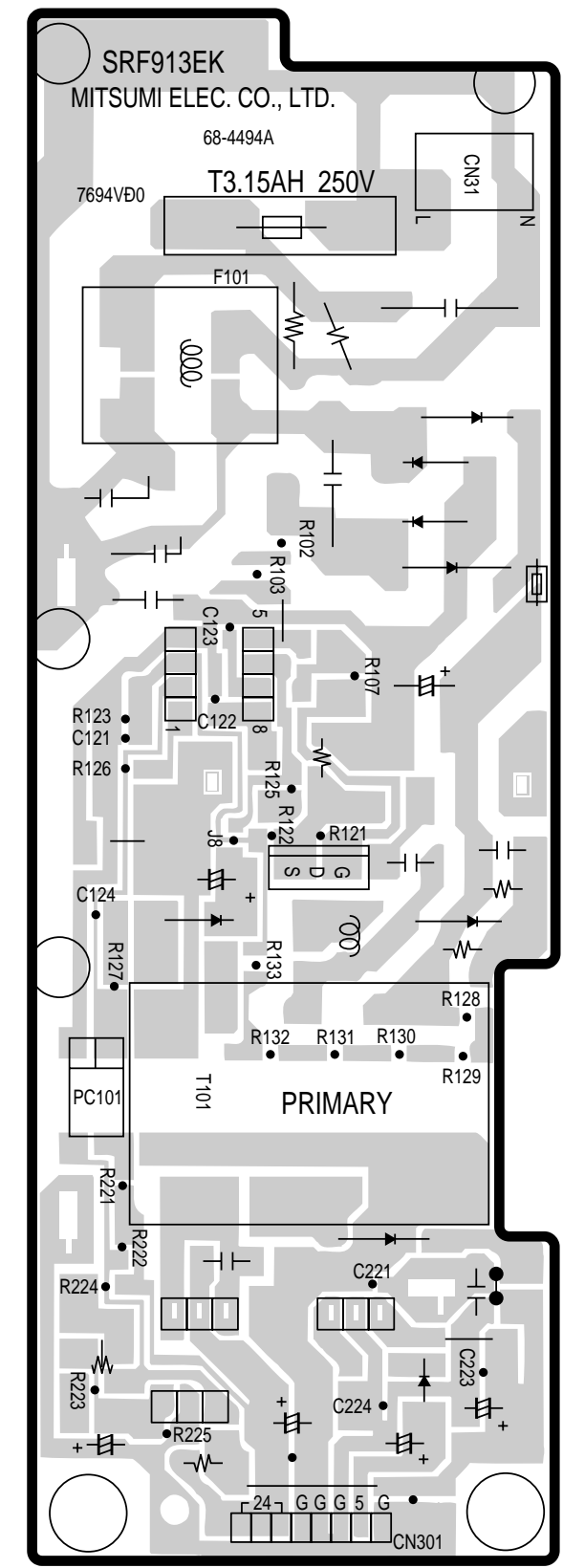
8.6. PRINTED CIRCUIT BOARD (OPERATION BOARD)

(COMPONENT VIEW)

(BOTTOM VIEW)

PFUP1146Z

PFUP1146Z
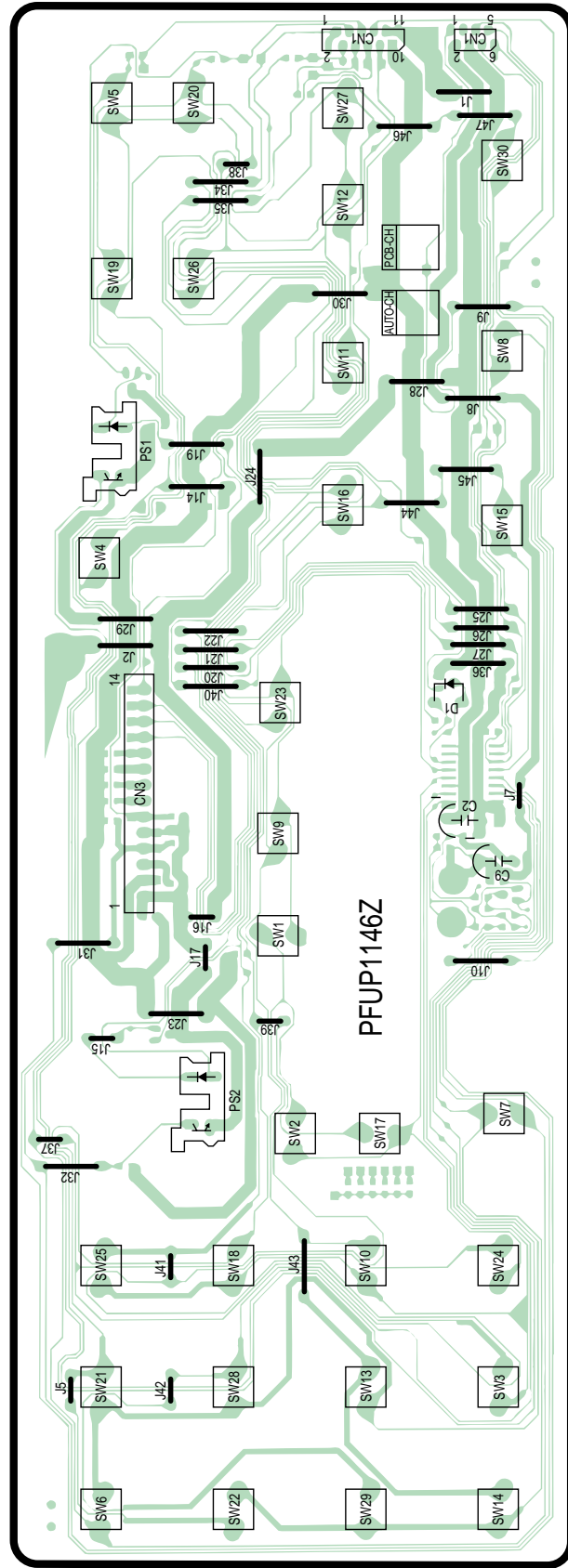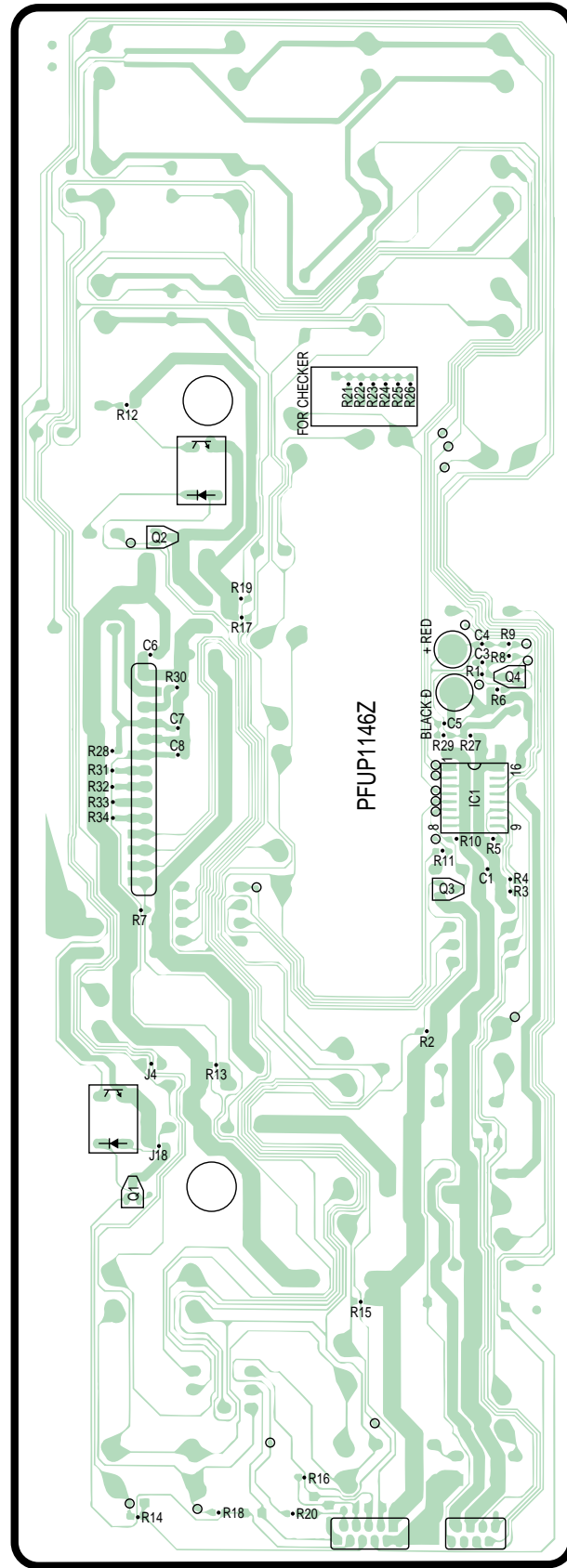
9 SCHEMATIC DIAGRAM

9.1. SCHEMATIC DIAGRAM (DIGITAL CIRCUIT)
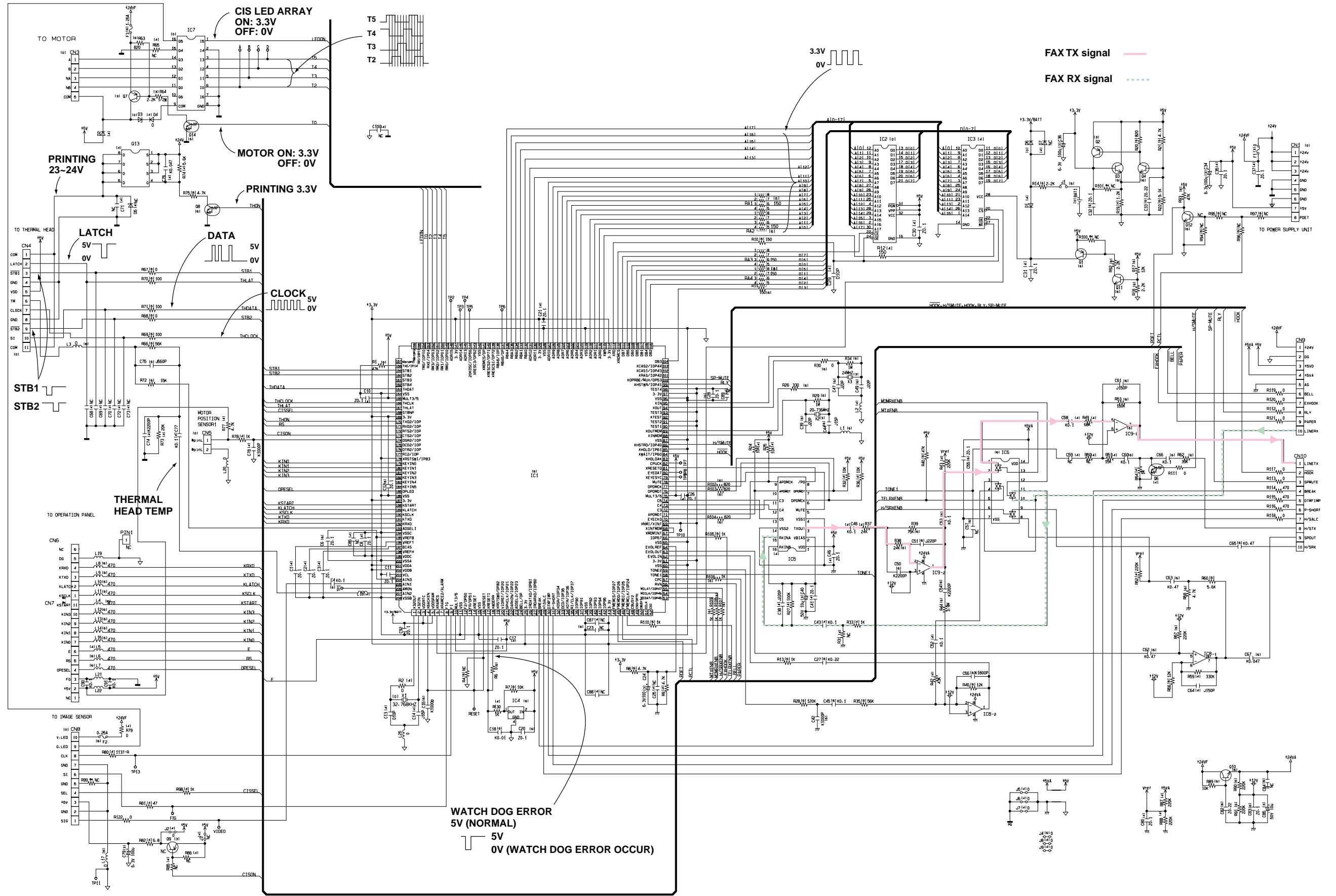
9.2. SCHEMATIC DIAGRAM (ANALOG CIRCUIT)
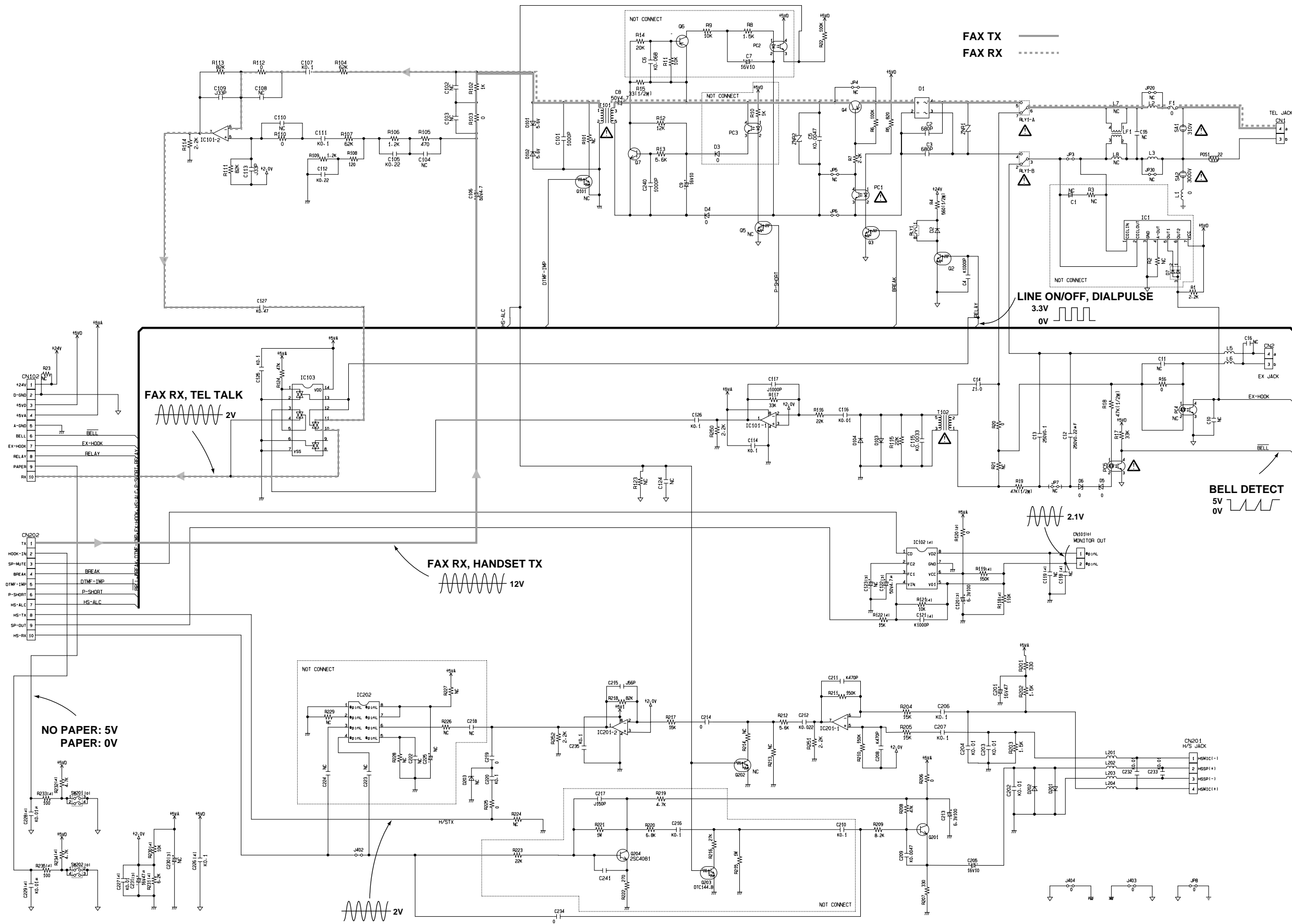
9.3. SCHEMATIC DIAGRAM (SWITCHING POWER SUPPLY)
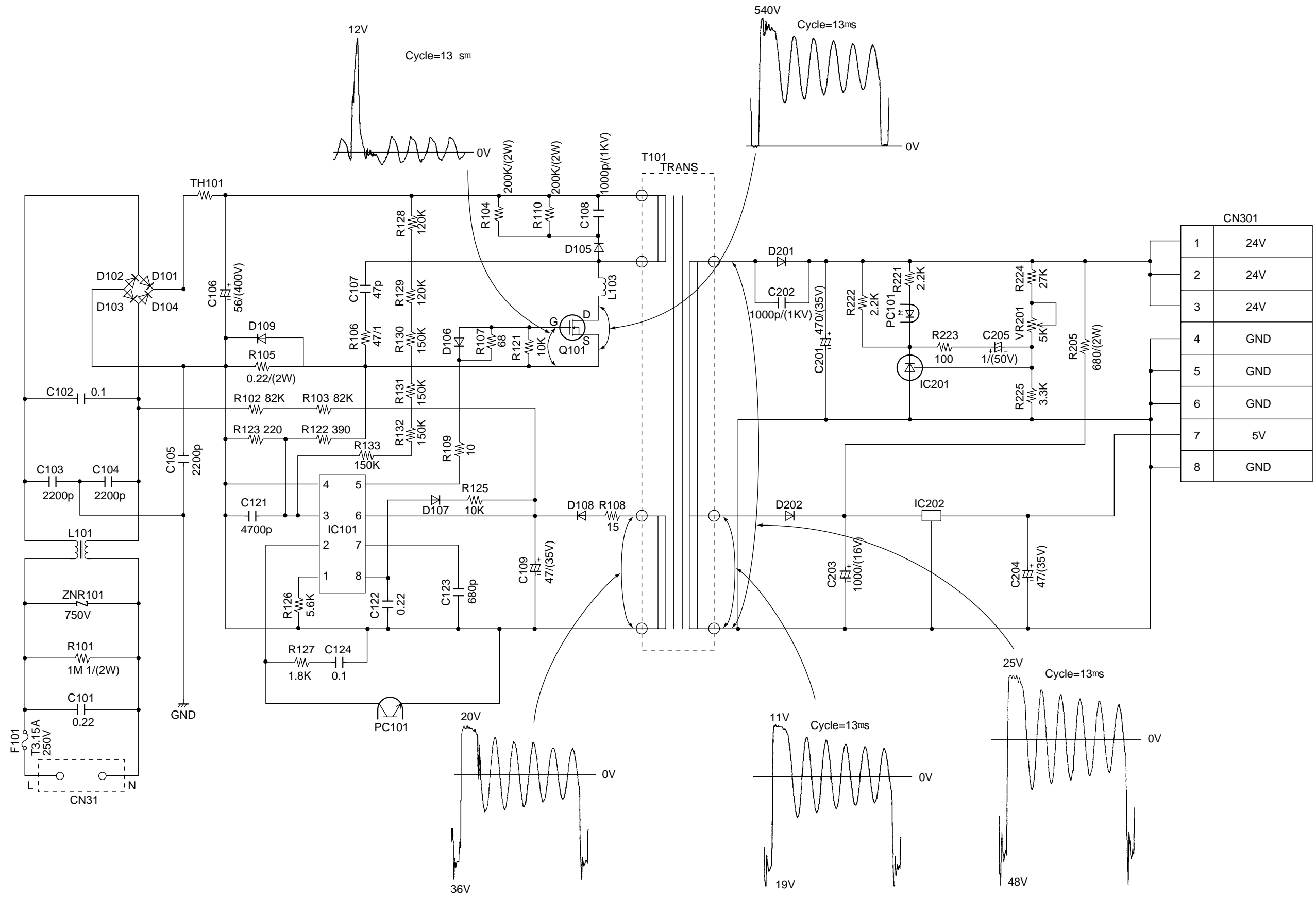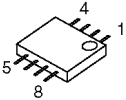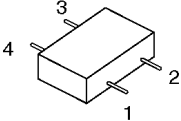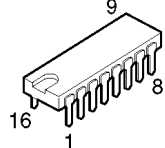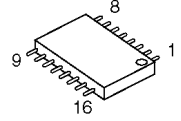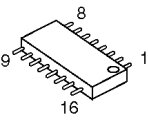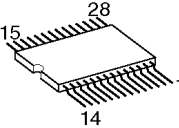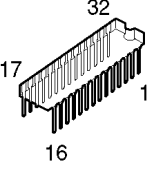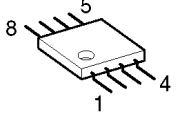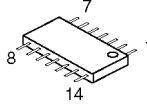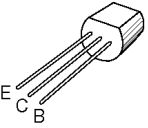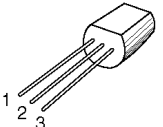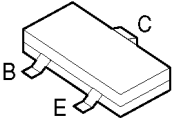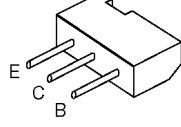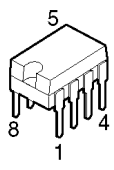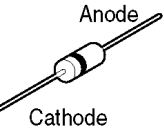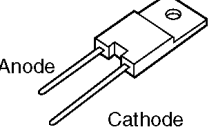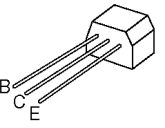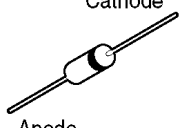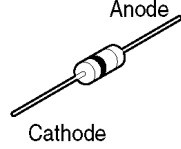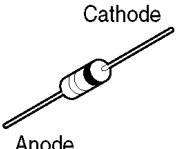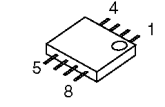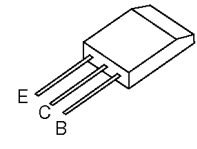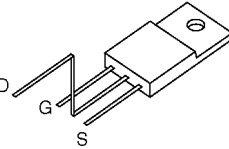
9.4. SCHEMATIC DIAGRAM (OPERATION CIRCUIT)
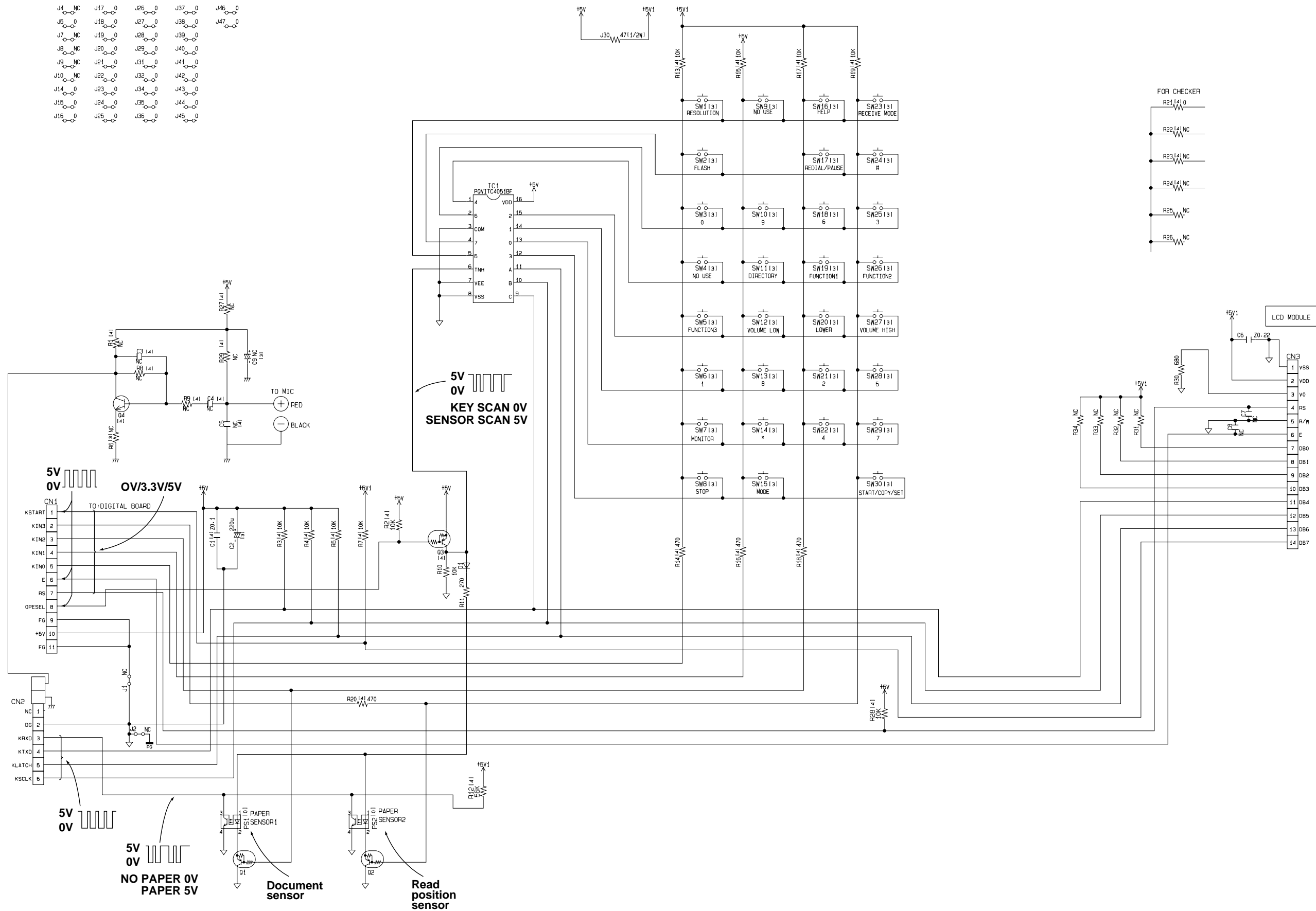
10 TERMINAL GUIDE OF THE IC´S TRANSISTORS AND DIODES

PFVIT7E05	PFVDDGS1ZB60 PFVIS80842AN	PFVIBA12003	PFVITC35133F	PQVICM4051BF
PFVIGM6256FF	PFWIFT21RS	PQVINJM2113M PQVIMC34119M PQVINJM4558M	PQVITC4066BF PFVIBU4066BF	2SC2235
RFVITA7805F AN1431T	PQVTDTA143EU PQVTDTC143E PQVTDTC114EU 2SC4155R, 2SB1197K	2SB1322	PFVIFA5317P	PQVDERA1506 PQVDERA1802 PFVDEG01C MA165
PFVDSF5LC20U	2SA933	1SS131	MA4220 MA7200, PFVD1N4005 PFVDD1NL20U	MA4056 PFVDRMRLS245
RLS71	PFVINJM2904M PFVTSI4431DY	2SA1627	2SK2651	

11 FIXTURES AND TOOLS
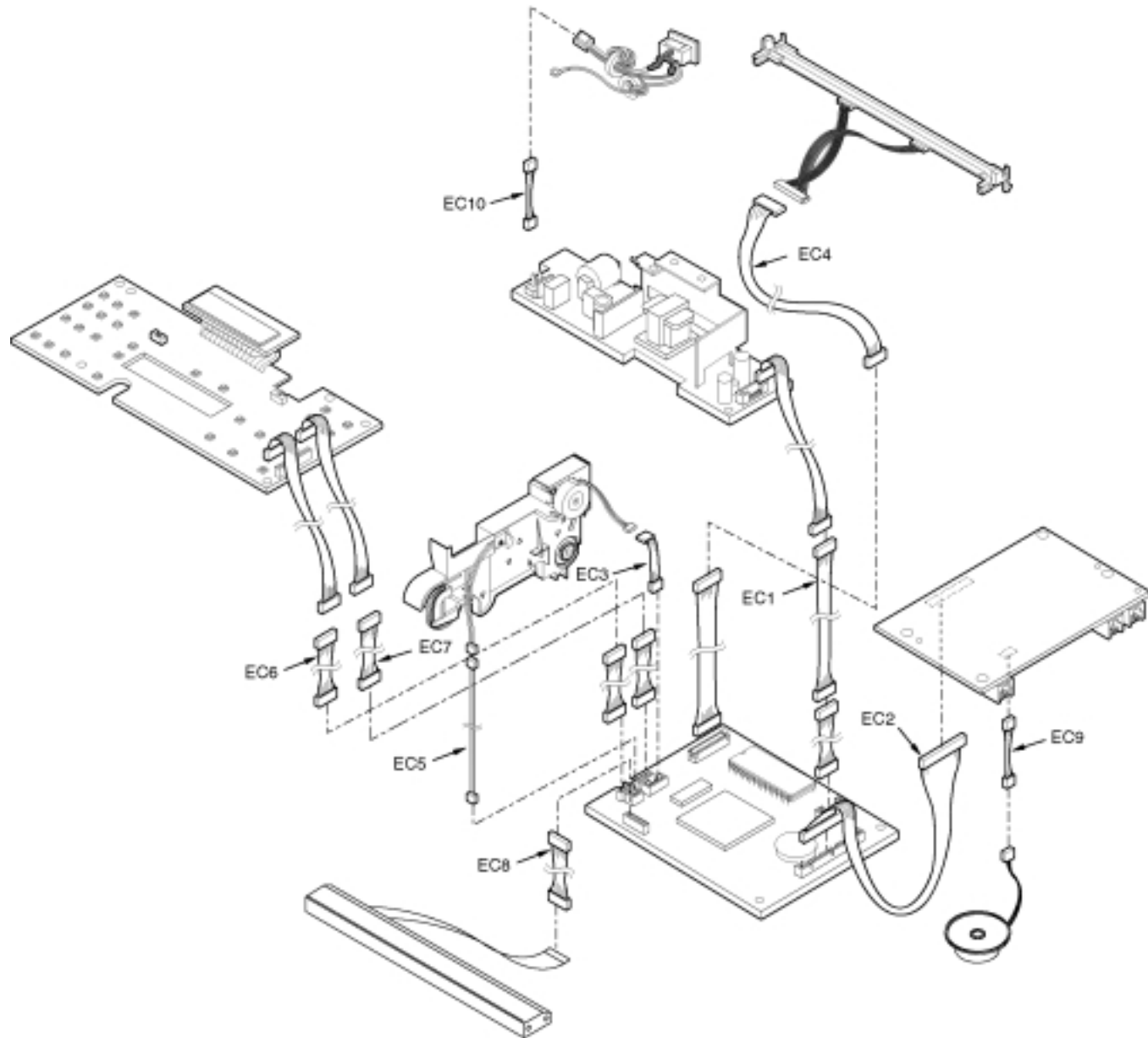
12 CABINET, MECHANICAL AND ELECTRICAL PARTS LOCATION

12.1. OPERATION PANEL SECTION
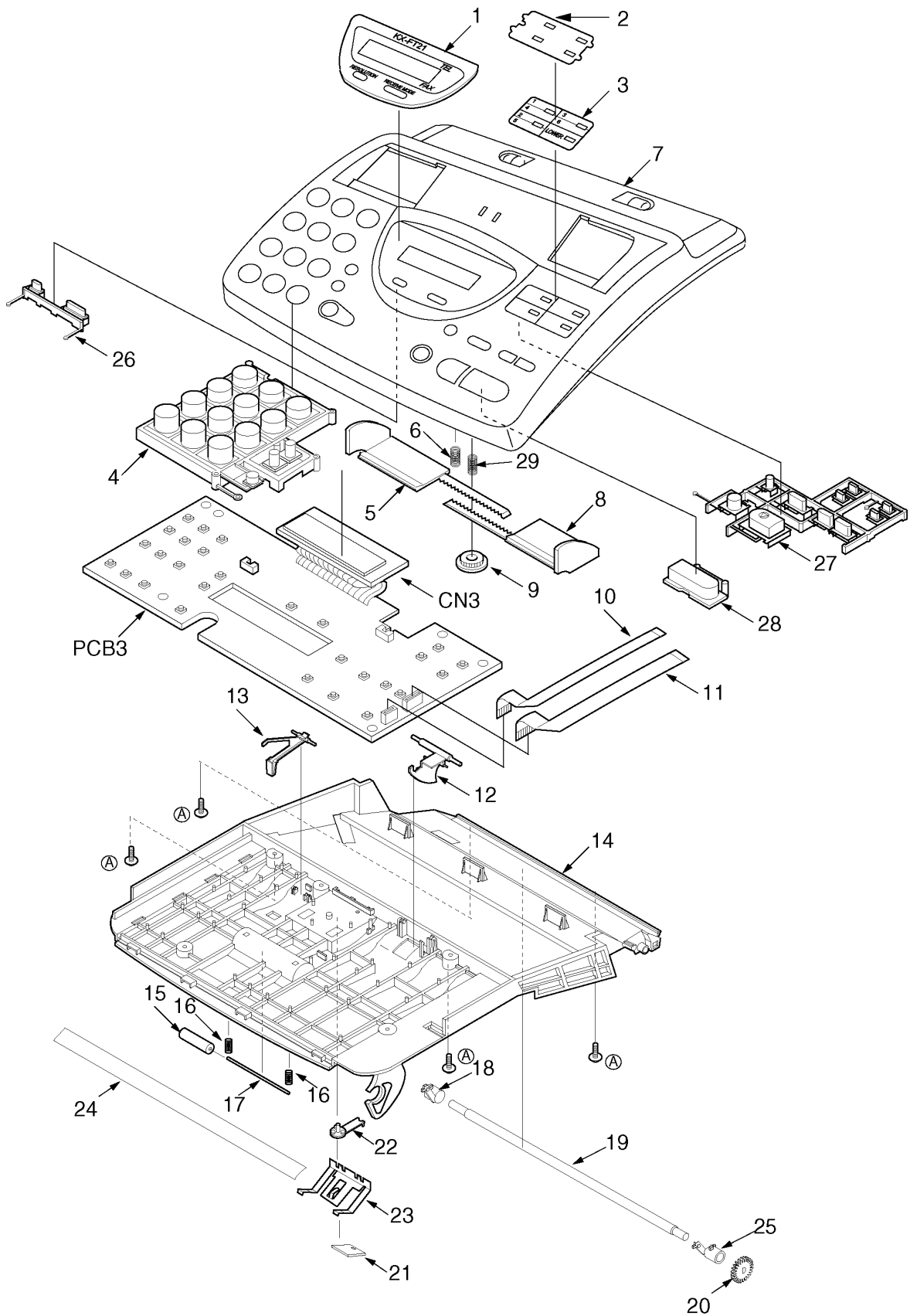
12.2. UPPER CABINET SECTION
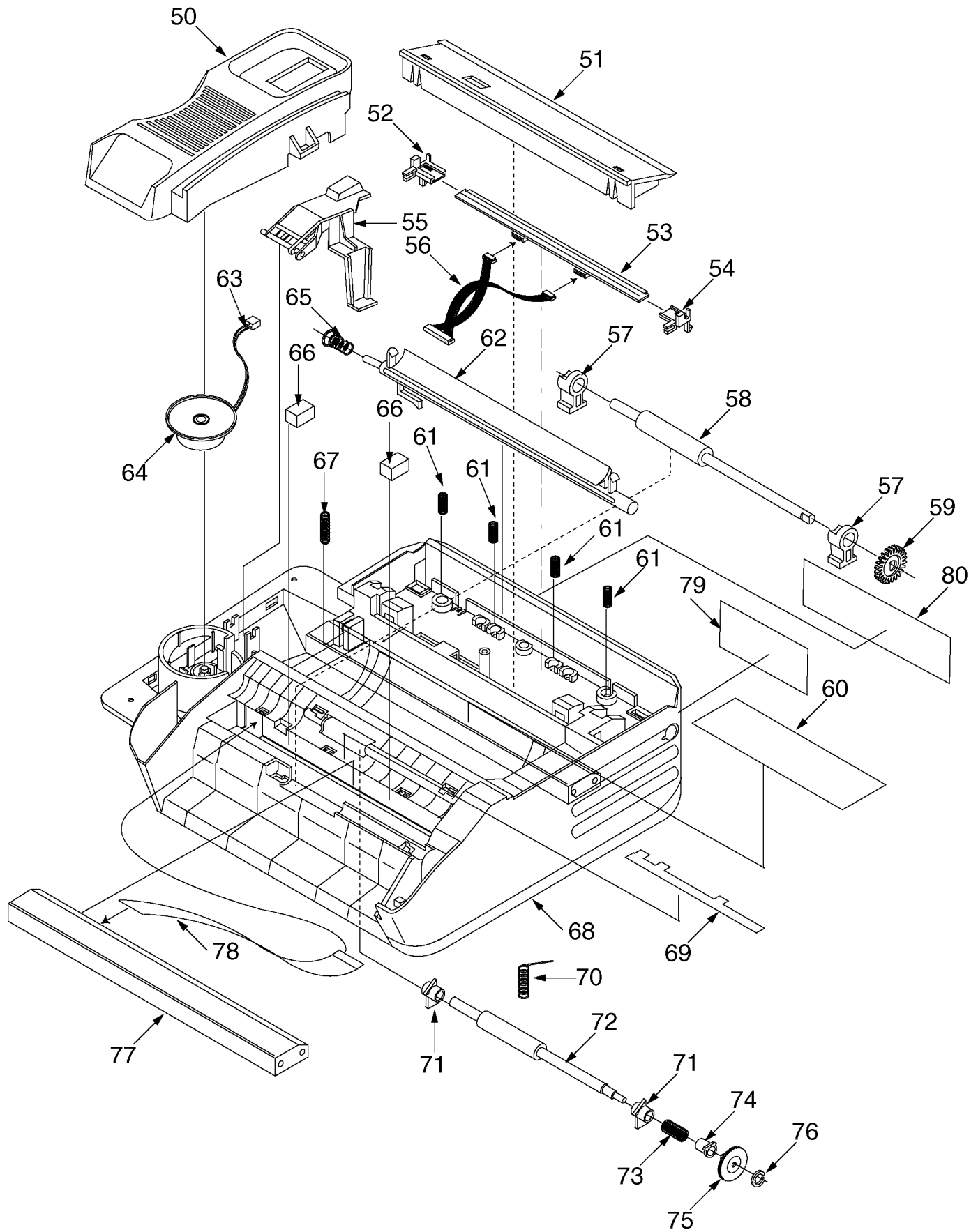
12.3. LOWER CABINET/P.C.B. SECTION

Refer to
12.4. MOTOR SECTION
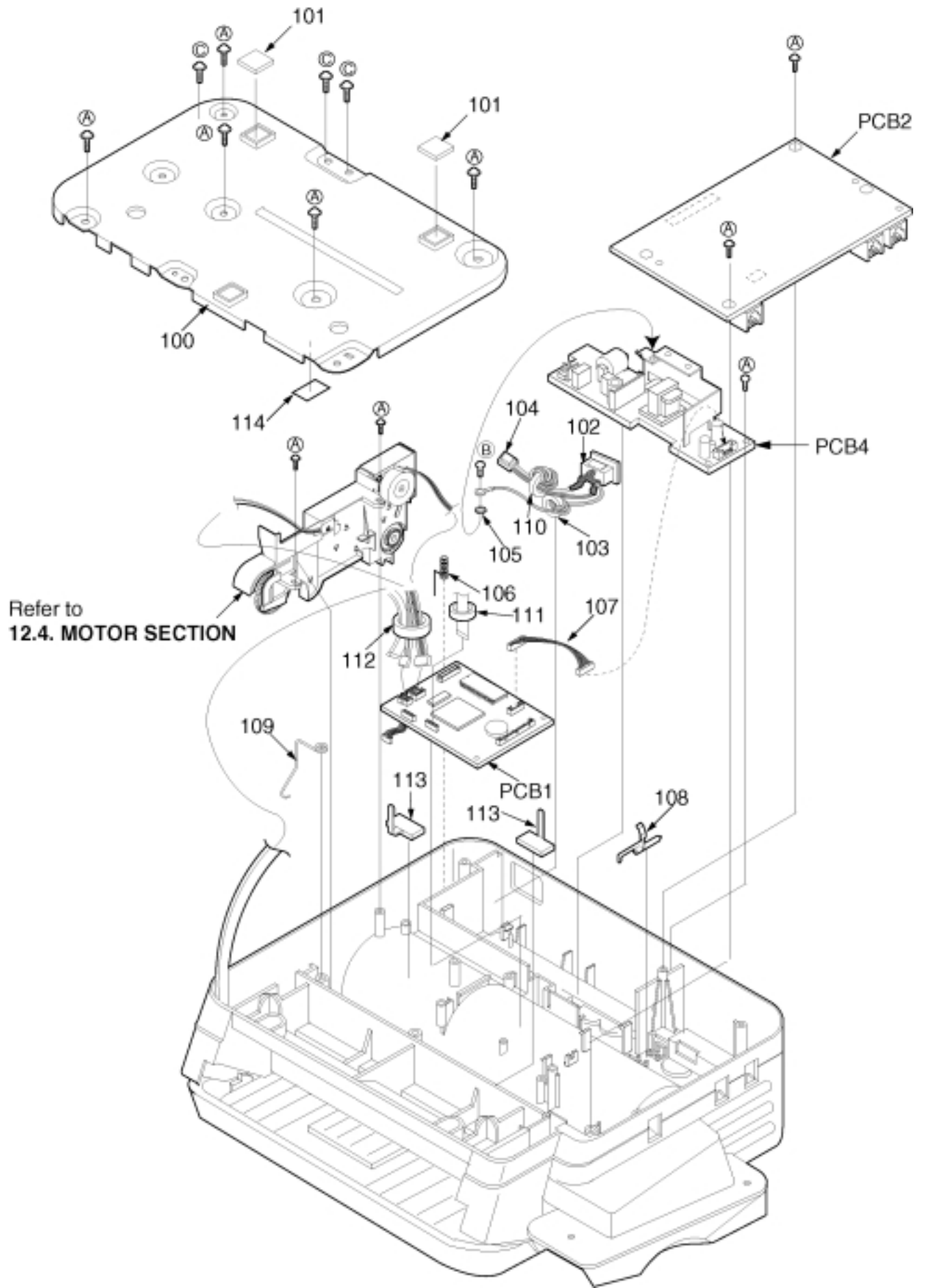
12.4. MOTOR SECTION
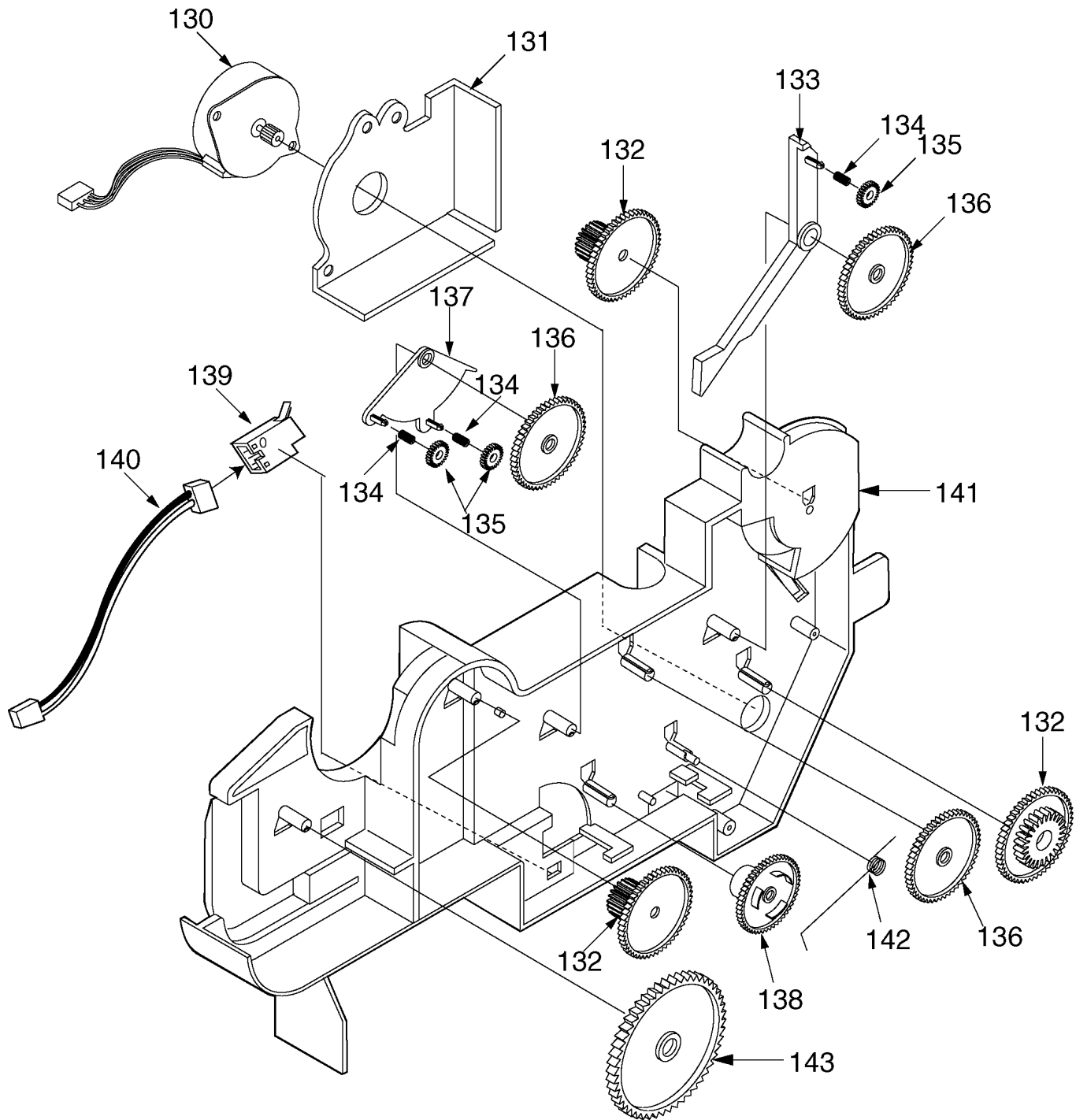
Note:

Make sure that Gears 1, 2 and 3 are installed face up. (The product number is put on the face.)

12.5. ACTUAL SIZE OF SCREWS AND WASHER

	Part No.	Illustration
Ⓐ	XTW3 + S10P	
Ⓑ	XSB4 + 6	
Ⓒ	XSN3 + W6FZ	

13 ACCESSORIES AND PACKING MATERIALS
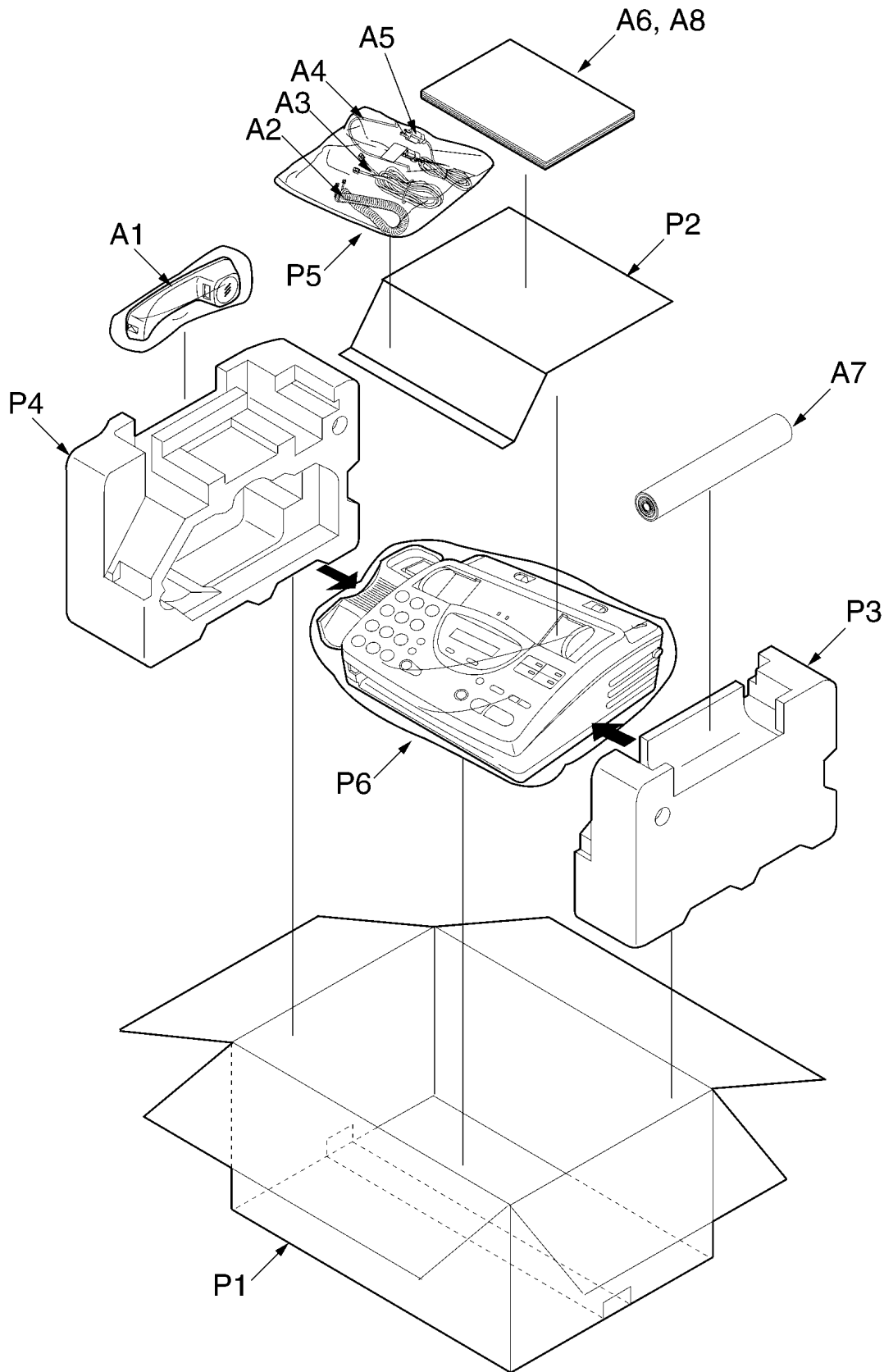
14 REPLACEMENT PARTS LIST

This replacement parts list is for KX-FT21RS only.

Refer to the simplified manual (cover) for other areas.

Notes:

1. The marking (RTL) indicates that the Retention Time is limited for this item.

   After the discontinuation of this assembly in production, the item will continue to be available for a specific period of time. The retention period of availability is dependent on the type of assembly, and in accordance with the laws governing parts and product retention.

   After the end of this period, the assembly will no longer be available.

2. Important safety notice

   Components identified by ⚠ mark have special characteristics important for safety. When replacing any of these components, use only manufacture´s specified parts.

3. The S mark indicates service standard parts and may differ from production parts.

4. RESISTORS & CAPACITORS

   Unless otherwise specified;

   All resistors are in ohms (Ω) K=1000Ω, M=1000kΩ

   All capacitors are in MICRO FARADS (μF) P=μμF

   *Type & Wattage of Resistor

Type

ERC:Solid	ERX:Metal Film	PQRD:Carbon
ERD:Carbon	ERG:Metal Oxide	PQRQ:Fuse
PQ4R:Chip	ERO:Metal Film	ERF:Wire Wound

Wattege

10,16,18:1/8W	14,25,S2:1/4W	12,50,S1:1/2W	1:1W	2:2W	5:5W

ECFD:Semi-Conductor	ECCD,ECKD,PQCBC,PQVP : Ceramic
ECQS:Styrol	ECQM,ECQV,ECQE,ECQU,ECQB : Polyester
PQCBX,ECUV:Chip	ECEA,ECSZ,ECOS : Electrolytic
ECMS:Mica	ECQP : Polypropylene

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others	
1H : 50V	05 : 50V	OF : 3.15V	OJ : 6.3V	1V : 35V
2A : 100V	1 : 100V	1A : 10V	1A : 10V	50,1H : 50V
2E : 250V	2 : 200V	1V : 35V	1C : 16V	1J : 63V
2H : 500V		OJ : 6.3V	1E,25 : 25V	2A : 100V

14.1. CABINET AND ELECTRICAL PARTS

Ref. No.	Part No.	Part Name & Description	Remarks
		(14.1.1.OPERATION PANEL SECTION)	
1	PFGP1140Z	PANEL, LCD	
2	PFGV1009Z	COVER, TEL CARD	
3	PFGD1043Z	TEL CARD	
4	PFBX1078Z1	KEY, DIAL	s
5	PFKR1014Z1	DOCUMENT GUIDE, L	s
6	PFUS1170	SPRING, DOCUMENT LEVER	
7	PFGG1039X1	OPERATION PANEL	s
8	PFKR1015Z1	DOCUMENT GUIDE, R	s
9	PFDG1015Y	GEAR, DOCUMENT GUIDE	
10	PFJE1007Z	LEAD, OPERATION	

Ref. No.	Part No.	Part Name & Description	Remarks
11	PFJE1006Z	LEAD, OPERATION	
12	PFDE1096Z	LEVER, DOCUMENT DETECTION	
13	PFDE1100Z	LEVER, READ DETECTION	
14	PFUV1024Z	COVER, OPERATION	
15	PQDR9685Y	ROLLER, SUPPORT	
16	PFUS1171Z	SPRING, ROLLER	
17	PFDF1017Z	SHAFT	
18	PFDJ1020Z	PLATEN SPACER, L	
19	PFDN1033Z	ROLLER, PLATEN	
20	PFDG1123Z	GEAR, PLATEN	
21	PFHG1064Z	SEPARATION RUBBER	
22	PFDE1101Z	LEVER, ADJUSTMENT	
23	PFUS1173Z	SPRING DOCUMENT FEED	
24	PFHX1251Z	READING SHEET	
25	PFDJ1021Z	PLATEN SPACER, R	
26	PFBX1080Z1	KEY, FUNCTION	s
27	PFBX1079Z1	KEY, 10	s
28	PFBC1041Z1	KEY, START	s
29	PFUS1222Z	SPRING, SLIDER	
		(14.1.2.UPPER CABINET/ THERMAL HEAD SECTION)	
50	PFKM1049Z1	HANDSET CRADLE	s
51	PFHR1132Z	COVER, HEAD	
52	PFDE1098Z	HEAD GUIDE, L	
53	PFJHS017Z	THERMAL HEAD	
54	PFDE1099Z	HEAD GUIDE, R	
55	PFBH1011Z1	BUTTON, HOOK	s
56	PFJS11Q45Z	CONNECTOR, 11PIN	
57	PFDJ1018Z	ROLLER HOLDER	
58	PFDN1032Z	ROLLER DOCUMENT FEED	
59	PFDG1122Z	GEAR EXIT ROLLER	
60	PFQT1503Z	CAUTION LABEL	
61	PFUS1172Y	SPRING THERMAL HEAD	
62	PFDE1102Z1	LEVER, LOCK	s
63	PFJS02Q64Z	CONNECTOR, 2PIN	
64	PFAS50P003Z	SPEAKER	
65	PFUS1179Z	SPRING, LOCK LEVER	
66	PFHE1019Z	IMASEN FORM	
67	PFUS1176Z	SPRING OPERATION COVER OPEN	
68	PFKM1048V1	MAIN CABINET	s
69	PFHX1268Y	SHEET, IMASEN	
70	PFUS1181Z	SPRING, EARTH	
71	PFDJ1013Y	SPACER, ROLLER	
72	PFDN1034Z	ROLLER, SEPARATION	
73	PQUS10055Z	SPRING, ONE WAY	s
74	PFDE1059Z	SPACER	
75	PFDG1124Z	GEAR SEPARATION ROLLER	
76	XUC2FY	RETAINING RING	
77	PF0U1021Z	IMAGE SENSOR	
78	PFJE1005Z	LEAD, IMAGE SENSOR	
79	PFGT1556Z-C	NAME PLATE	s
80	PFQT1186Y	CAUTION LABEL	
		(14.1.3. LOWER SECTION)	
100	PFMD1039Z	FRAME, BOTTOM	
101	PFHA1001Z	LEG RUBBER	
102	PFJP03S04Z	AC INLET	⚠
103	PQLB1E1	FERRITE CORE	
104	PFJS02R19Y	CONNECTOR, 2PIN	
105	XWC4B	WASHER	
106	PFUS1177Z	SPRING, EARTH	
107	PFJS08R44Z	CONNECTOR, 8PIN	

Ref. No.	Part No.	Part Name & Description	Remarks
108	PFDE1097Z	LEVER PAPER SENSOR	
109	PFUS1214Z	SPRING, EARTH	
110	KR06TT251508	FFERRITE CORE	
111	PQLB1E1	FFERRITE CORE	
112	KR06TT251508	FFERRITE CORE	
113	PQHR136Z	CLAMPER	
114	PFHX1340Z	BOTTOM PLATE SHEET	
		(14.1.4. GEAR CHASSIS SECTION)	
130	PFJQ1015Z	MOTOR	
131	PFMH1069Z	MOTOR PLATE	
132	PFDG1119Z	GEAR, IDLER A	
133	PFDE1095Z	ARM, RX	
134	PFUS1062Z	SPRING, GEAR C	
135	PFDG1021Z	GEAR C	
136	PFDG1022Z	GEAR D	
137	PFDE1094Z	ARM, TX	
138	PFDG1121Z	GEAR, CAM	
139	PQST2A04Z	SENSOR, CAM	
140	PFJS03Q43Z	CONNECTOR, 3PIN	
141	PFUA1022Z	CHASSIS, GEAR	
142	PFUS1169Z	SPRING, ARM	
143	PFDG1120Z	GEAR, IDLER B	
		14.1.5. ACCESSORIES AND PACKING MATERIALS	
A1	PFJXE0801Z	HANDSET	
A2	PFJA1029Y	CURL CORD	⚠
A3	PQJA10075Z	TEL CORD	⚠
A4	PFUS1167Z	STACKER	
A5	PQJA10038Y	POWER CORD	⚠
A6	PFQX1378Z	INSTRUCTION BOOK	
A7	PFHP1063Z	RECORDING PAPER	
A8	PFQW1318Z	LEAFLET	
P1	PFPE1060Z	PACKAGE ASS´Y	
P2	PFPD1089Z	CUSHION	
P3	PFPN1187Z	CUSHION	
P4	PFPN1186Z	CUSHION	
P5	PQPP10005Z	BAG, POLYETHYLENE	
P6	PQPH97Z	SOFT SHEET	

14.2. DIGITAL BOARD PARTS

Ref. No.	Part No.	Part Name & Description	Remarks
PCB1	PFWP1FT21RS	DIGITAL BOARD ASS´Y (RTL)	
		(ICS)	
IC1	PFVIT7E05	IC	
IC2	PFWIFT21RS	IC	
IC3	PFVIGM6256FF	IC	
IC4	PFVIS80842AN	IC	
IC5	PFVITC35133F	IC	
IC6	PFVIBU4066BF	IC	
IC7	PQVIBA12003	IC	S
IC8	PQVINJM4558M	IC	S
IC9	PQVINJM4558M	IC	S
		(TRANSISTORS)	
Q1	2SB1197K	TRANSISTOR(SI)	

Ref. No.	Part No.	Part Name & Description	Remarks
Q2	2SA933	TRANSISTOR(SI)	
Q3	2SC4155R	TRANSISTOR(SI)	
Q4	2SC4155R	TRANSISTOR(SI)	
Q6	PQVTDTC114EU	TRANSISTOR(SI)	
Q7	2SB1322	TRANSISTOR(SI)	S
Q8	PQVTDTC114EU	TRANSISTOR(SI)	
Q10	2SC4155R	TRANSISTOR(SI)	
Q11	2SC4155R	TRANSISTOR(SI)	
Q13	PFVTSI4431DY	TRANSISTOR(SI)	
Q14	PQVTDTC114EU	TRANSISTOR(SI)	
		(DIODES)	
D1	RLS71	DIODE(SI)	
D2	PFVDRMRLS245	DIODE(SI)	
D3	MA7200	DIODE(SI)	
D6	1SS131	DIODE(SI)	
		(BATTERY)	
BAT1	PQPCR2032H09	BATTERY	S
		(CONNECTORS)	
CN3	PQJP5G30Y	CONNECTOR, 5P	
CN4	PQJP11G100Z	CONNECTOR, 11P	
CN5	PQJP2G30Y	CONNECTOR, 2P	
CN6	PFJS06A13Z	CONNECTOR, 6P	
CN7	PFJS11A13Z	CONNECTOR, 11P	
CN8	PFJS10A13Z	CONNECTOR, 10P	
CN9	PQJP10A19Z	CONNECTOR, 10P	
CN10	PQJP10A19Z	CONNECTOR, 10P	
		(FUSES)	
F1	XBAPF001312	FUSE	
F2	PFRB001251KC	FUSE	
F3	PFRB002122KZ	FUSE	
		(COILS)	
L1	PQLQR1ET	COIL	
L2	PQLQR1ET	COIL	
L18	PQLQR1RM601	COIL	S
L19	PQLQZK3R3K	COIL	
L21	PQLQZK3R3K	COIL	
L22	PQLQZK3R3K	COIL	
R80	PQLQR2KB113T	COIL	
		(COMPONENTS PARTS)	
RA1	PFXBV8V151JV	COMPONENTS PARTS	
RA2	PFXBV8V151JV	COMPONENTS PARTS	
RA3	PFXBV8V151JV	COMPONENTS PARTS	
RA4	PFXBV8V151JV	COMPONENTS PARTS	
		(CRYSTAL OSCILLATORS)	
X1	PFVC3276AZA	CRYSTAL OSCILLATOR	
X2	PFVC2073FZAT	CRYSTAL OSCILLATOR	
X3	PFVBKB240ZAT	CRYSTAL OSCILLATOR	

Ref. No.	Part No.	Part Name & Description	Remarks	Ref. No.	Part No.	Part Name & Description	Remarks
				R46	ERJ3GEYJ123	12k	
				R49	ERJ3GEYJ683	68k	
		(RESISTORS)					
				R51	ERJ3GEYJ153	15k	
J2	ERJ3GEY0R00	0		R52	ERJ3GEYJ224	220k	
J4	ERJ3GEY0R00	0		R53	ERJ3GEYJ154	150k	
J5	ERJ6GEY0R00	0		R54	ERJ3GEYJ105	1M	
J6	ERJ6GEY0R00	0		R56	ERJ3GEYJ123	12k	
J7	ERJ6GEY0R00	0		R57	ERJ3GEYJ224	220k	
J8	ERJ8GEY0R00	0		R58	ERJ3GEYJ472	4.7k	
J9	ERJ8GEY0R00	0		R59	ERJ3GEYJ334	330k	
L3	ERJ3GEY0R00	0		R60	ERJ3GEYJ562	5.6k	
L4	ERJ3GEYJ471	470		R62	ERJ3GEYJ393	39k	
L5	ERJ3GEYJ471	470		R63	ERJ3GEYJ821	820	
L6	ERJ3GEYJ471	470		R64	ERDS1TJ222	2.2k	
L7	ERJ3GEYJ471	470		R66	ERJ3GEYJ563	56k	
L8	ERJ3GEYJ471	470		R67	ERJ3GEY0R00	0	
L9	ERJ3GEYJ471	470		R68	ERJ3GEY0R00	0	
				R69	ERJ3GEYJ101	100	
L10	ERJ3GEYJ471	470					
L11	ERJ3GEYJ471	470		R70	ERJ3GEYJ101	100	
L12	ERJ3GEYJ471	470		R71	ERJ3GEYJ101	100	
L13	ERJ3GEYJ471	470		R72	ERJ3GEYJ153	15k	
L14	ERJ3GEYJ471	470		R73	ERJ3GEYJ203	20k	
L15	ERJ3GEYJ471	470		R74	ERJ3GEYJ562	5.6k	
L17	ERJ3GEY0R00	0		R75	ERJ3GEYJ472	4.7k	
				R77	ERJ3GEYJ472	4.7k	
L20	ERJ3GEY0R00	0		R78	ERJ3GEYJ102	1k	
L25	ERJ8GEY0R00	0		R79	ERJ3GEY0R00	0	
D4	ERJ8GEY0R00	0		R81	ERJ3GEYJ470	47	
				R82	ERJ3GEYJ6R8	6.8	
R1	ERJ3GEYJ473	47k		R87	ERJ3GEYJ224	220k	
R2	ERJ3GEY0R00	0		R88	ERJ3GEYJ224	220k	
R6	ERJ3GEY0R00	0		R89	ERJ3GEYJ103	10k	
R7	ERJ3GEYJ103	10k					
R8	ERJ3GEYJ472	4.7k		R90	ERJ3GEYJ224	220k	
R9	ERJ3GEYJ472	4.7k		R91	ERJ3GEYJ224	220k	
				R92	ERJ3GEYJ222	2.2k	
R10	ERJ3GEYJ151	150		R93	ERJ3GEYJ473	47k	
R11	ERJ3GEYJ151	150		R98	ERJ3GEYJ102	1k	
R12	ERJ3GEYJ151	150					
R13	ERJ3GEYJ102	1k		R102	ERJ3GEYJ821	820	
R14	ERJ3GEYJ222	2.2k		R103	ERJ3GEYJ821	820	
R17	ERJ3GEYJ123	12k		R104	ERJ3GEYJ821	820	
R18	ERJ3GEYJ222	2.2k		R105	ERJ3GEYJ102	1k	
R19	ERJ3GEYJ122	1.2k		R106	ERJ3GEYJ102	1k	
				R107	ERJ3GEYJ102	1k	
R20	ERJ3GEYJ821	820		R108	ERJ3GEYJ102	1k	
R21	ERJ3GEYJ472	4.7k		R109	ERJ3GEYJ102	1k	
R22	ERJ3GEYJ912	9.1k					
R24	ERJ3GEYJ103	10k		R110	ERJ3GEYJ102	1k	
R25	ERJ3GEYJ103	10k		R111	ERJ3GEY0R00	0	
R26	ERJ3GEYJ331	330		R112	ERJ3GEY0R00	0	
R27	ERJ3GEYJ104	100k		R113	ERJ3GEY0R00	0	
R28	ERJ3GEYJ124	120k		R114	ERJ3GEYJ471	470	
R29	ERJ3GEYJ105	1M		R115	ERJ3GEYJ471	470	
				R116	ERJ3GEYJ471	470	
R30	ERJ3GEY0R00	0		R117	ERJ3GEY0R00	0	
R32	ERJ3GEYJ103	10k		R118	ERJ3GEY0R00	0	
R33	ERJ3GEYJ102	1k		R119	ERJ3GEY0R00	0	
R34	ERJ3GEYJ105	1M					
R35	ERJ3GEYJ563	56k		R120	ERJ3GEY0R00	0	
R36	ERJ3GEYJ103	10k		R121	ERJ3GEY0R00	0	
R37	ERJ3GEYJ243	24k		R122	ERJ3GEY0R00	0	
R38	ERJ3GEYJ243	24k					
R39	ERJ3GEYJ753	75k		R130	ERJ3GEYJ102	1k	
R40	ERJ3GEYJ473	47k					
R42	ERJ3GEYJ433	43k					
R43	ERJ3GEYJ224	220k				(CAPACITORS)	
R44	ERJ3GEYJ395	3.9M					

Ref. No.	Part No.	Part Name & Description	Remarks
C1	ECUV1H104ZFV	0.1	S
C2	ECUV1H104ZFV	0.1	S
C3	ECUV1H104ZFV	0.1	S
C4	ECUV1C104KBV	0.1	
C6	ECUV1H104ZFV	0.1	S
C8	ECUV1H104ZFV	0.1	S
C10	ECUV1H104ZFV	0.1	S
C11	ECUV1H104ZFV	0.1	S
C12	ECUV1H104ZFV	0.1	S
C13	ECUV1H100DCV	10P	
C14	ECUV1H150JCV	15P	
C15	ECUV1H102KBV	0.001	
C17	ECUV1H104ZFV	0.1	S
C18	ECUV1H103KBV	0.01	
C20	ECUV1H104ZFV	0.1	S
C21	ECUV1H104ZFV	0.1	S
C24	ECEA1CK101	100	S
C26	ECUV1H104ZFV	0.1	S
C27	PQCUV1C224KB	0.22	
C28	ECUV1H104ZFV	0.1	S
C29	ECUV1H100DCV	10P	
C30	ECUV1H104ZFV	0.1	S
C31	ECUV1H104ZFV	0.1	S
C32	ECUV1H104ZFV	0.1	S
C33	PQCUV1C224ZF	0.22	
C34	ECEA1CK101	100	S
C35	PQCUV1E104MD	0.1	S
C36	ECEA1CK101	100	S
C37	PQCUV1E104MD	0.1	S
C38	ECUV1H221JCV	220P	
C39	ECUV1H220JCV	22P	
C40	ECEA1HKS100	10	S
C41	ECUV1H104ZFV	0.1	S
C42	ECUV1H102KBV	0.001	
C43	ECUV1C104KBV	0.1	
C44	ECUV1H150JCV	15P	
C45	ECUV1C104KBV	0.1	
C46	ECUV1H104ZFV	0.1	S
C47	ECUV1H220JCV	22P	
C48	ECUV1C104KBV	0.1	
C49	ECUV1H220JCV	22P	
C50	ECUV1H222KBV	0.0022	
C51	ECUV1H221JCV	220P	
C52	ECUV1C104KBV	0.1	
C53	ECUV1C104KBV	0.1	
C54	ECUV1H222KBV	0.0022	
C55	ECUV1H104ZFV	0.1	S
C56	ECUV1H182KBV	0.0018	
C58	ECUV1C104KBV	0.1	
C60	ECUV1C104KBV	0.1	
C61	ECUV1H151JCV	150P	
C62	PQCUV1C474KB	0.47	
C63	PQCUV1C474KB	0.47	
C64	PQCUV1H151JC	150P	
C65	PQCUV1C474KB	0.47	
C66	ECUV1C104KBV	0.1	
C67	ECUV1C473KBV	0.047	
C74	ECUV1H222KBV	0.0022	
C75	ECUV1H561JCV	560P	
C76	ECUV1E473KBV	0.047	
C77	ECUV1C104KBV	0.1	
C78	ECUV1H102KBV	0.001	
C79	ECEA1CK101	100	S
C80	ECUV1H104ZFV	0.1	S
C82	PQCUV1E224MD	0.22	S

Ref. No.	Part No.	Part Name & Description	Remarks
C83	ECUV1H104ZFV	0.1	S
C85	ECEA1HKS100	10	S
C90	ECUV1C104KBV	0.1	
C91	ECUV1C104KBV	0.1	
C92	ECUV1H104ZFV	0.1	S

14.3. ANALOG BOARD PARTS

Ref. No.	Part No.	Part Name & Description	Remarks
PCB2	PFLP1258RSZ	ANALOG BOARD ASS´Y (RTL)	
		(ICS)	
IC101	PFVINJM2904M	IC	⚠
IC102	PQVINJM2113M	IC	
IC103	PQVITC4066BF	IC	S
IC201	PFVINJM2904M	IC	
		(TRANSISTORS)	
Q2	PQVTDTC143E	TRANSISTOR(SI)	
Q3	PQVTDTC143E	TRANSISTOR(SI)	
Q4	2SA1627	TRANSISTOR(SI)	
Q7	2SC2235	TRANSISTOR(SI)	
Q201	2SC4155R	TRANSISTOR(SI)	
		(DIODES)	
D1	PFVDDGS1ZB60	DIODE(SI)	
D2	1SS131	DIODE(SI)	
D101	MA4056	DIODE(SI)	
D102	MA4056	DIODE(SI)	
D103	1SS131	DIODE(SI)	
D104	1SS131	DIODE(SI)	
D201	1SS131	DIODE(SI)	
D202	1SS131	DIODE(SI)	
		(CONNECTORS)	
CN101	PQJP02G100Z	CONNECTOR, 2P	
CN102	PQJS10A10Z	CONNECTOR, 10P	
CN202	PQJS10A10Z	CONNECTOR, 10P	
		(JACKS)	
CN1	PFJJ1T01Z	JACK	
CN2	PFJJ1T01Z	JACK	
CN201	PQJJ1TB18Z	JACK	
		(COILS)	
L2	PQLQR2BT	COIL	S
L3	PQLQR2BT	COIL	S
L5	PQLQZK330K	COIL	
L6	PQLQZK330K	COIL	
L201	PQLQR2BT	COIL	S
L202	PQLQR2BT	COIL	S
L203	PQLQR2BT	COIL	S
L204	PQLQR2BT	COIL	S
LF1	PFLE003	COIL	S

Ref. No.	Part No.	Part Name & Description	Remarks
		(PHOTO ELECTRIC TRANSDUCERS)	
PC1	PQVIPS2532-1	PHOTO ELECTRIC TRANSDUCER	S ⚠
PC5	PQVIPC814K	PHOTO ELECTRIC TRANSDUCER	⚠
		(THERMISTOR)	
POS1	PFRT002	THERMISTOR	
		(RELAY)	
RLY1	ATXD20328	RELAY	⚠
		(VARISTORS)	
SA1	PQVDRA311PT3	VARISTOR	S ⚠
SA2	PFRZ001Z	VARISTOR	⚠
		(SWITCHES)	
SW201	PFSH1A03Z	SWITCH	
SW202	ESE14A211	SWITCH	
		(TRANSFORMERS)	
T101	PFLT8E003	TRANSFORMER	⚠
T102	PFLT8E004	TRANSFORMER	⚠
		(VARISTORS)	
ZNR1	ERZVA7D121	VARISTOR	
ZNR2	ERZVA7D121	VARISTOR	
		(RESISTORS)	
C214	ERJ3GEY0R00	0	
C219	ERJ3GEY0R00	0	
C234	ERJ3GEY0R00	0	
J402	ERJ3GEY0R00	0	
J403	ERJ3GEY0R00	0	
J404	ERJ8GEY0R00	0	
R1	ERJ3GEYJ222	2.2k	
R4	ERDS1TJ561	560	
R5	ERJ3GEYJ821	820	
R6	ERDS2TJ104	100k	
R7	ERDS2TJ222	2.2k	
R12	PQ4R10XJ123	12k	S
R13	PQ4R10XJ562	5.6k	S
R15	ERDS1TJ330	33	S
R17	ERJ3GEYJ333	33k	
R18	ERDS1TJ473	47k	
R19	ERDS1TJ473	47k	
R22	ERJ3GEYJ104	100k	
R102	ERJ3GEYJ102	1k	
R103	ERJ3GEY0R00	0	
R104	ERJ3GEYJ623	62k	
R105	ERJ3GEYJ471	470	
R106	ERJ3GEYJ122	1.2k	

Ref. No.	Part No.	Part Name & Description	Remarks
R107	ERJ3GEYJ623	62k	
R108	ERJ3GEYJ121	120	
R109	ERJ3GEYJ122	1.2k	
R110	ERJ3GEY0R00	0	
R111	ERJ3GEYJ823	82k	
R112	ERJ3GEY0R00	0	
R113	ERJ3GEYJ823	82k	
R114	ERJ3GEYJ222	2.2k	
R115	ERJ3GEYJ223	22k	
R116	ERJ3GEYJ223	22k	
R117	ERJ3GEYJ333	33k	
R118	ERJ3GEYJ114	110k	
R119	ERJ3GEYJ154	150k	
R120	ERJ3GEY0R00	0	
R121	ERJ3GEYJ103	10k	
R122	ERJ3GEYJ153	15k	
R124	ERJ3GEYJ473	47k	
R201	ERJ3GEYJ331	330	
R202	ERJ3GEYJ152	1.5k	
R203	ERJ3GEYJ152	1.5k	
R204	ERJ3GEYJ153	15k	
R205	ERJ3GEYJ153	15k	
R206	ERJ3GEY0R00	0	
R207	ERJ3GEYJ331	330	
R208	ERJ3GEYJ473	47k	
R209	ERJ3GEYJ822	8.2k	
R210	ERJ3GEYJ154	150k	
R211	ERJ3GEYJ154	150k	
R212	ERJ3GEYJ562	5.6k	
R217	ERJ3GEYJ153	15k	
R218	ERJ3GEYJ823	82k	
R225	ERJ3GEY0R00	0	
R230	ERJ3GEYJ103	10k	
R231	ERJ3GEYJ622	6.2k	
R232	ERJ3GEYJ472	4.7k	
R233	ERJ3GEYJ101	100	
R234	ERJ3GEYJ472	4.7k	
R235	ERJ3GEYJ101	100	
R250	ERJ3GEYJ222	2.2k	
R251	ERJ3GEYJ222	2.2k	
R252	ERJ3GEYJ222	2.2k	
		(CAPACITORS)	
C2	ECKD2H681KB	680P	S
C3	ECKD2H681KB	680P	S
C4	ECUV1H102KBV	0.001	
C5	PQCUV1H472KB	0.0047	
C8	ECEA1HKS4R7	4.7	
C9	ECEA1CKS100	10	S
C12	ECQE2E224JZ	0.22	S
C13	ECQE2E104KZ	0.1	S
C14	PQCUV1H105JC	1	S
C101	ECUV1H102KBV	0.001	
C105	PQCUV1C224KB	0.22	
C106	ECEA1HKS4R7	4.7	
C107	ECUV1C104KBV	0.1	
C109	ECUV1H330JCV	33P	
C111	ECUV1C104KBV	0.1	
C112	PQCUV1C224KB	0.22	
C113	ECUV1H330JCV	33P	

Ref. No.	Part No.	Part Name & Description	Remarks
C114	ECUV1C104KBV	0.1	
C115	ECUV1H332KBV	0.0033	
C116	ECUV1H103KBV	0.01	
C117	ECUV1H102KBV	0.001	
C120	ECEA1CK101	100	S
C121	ECUV1H102KBV	0.001	
C122	ECEA1HKS4R7	4.7	
C125	ECUV1C104KBV	0.1	
C126	ECUV1C104KBV	0.1	
C127	PQCUV1C474KB	0.47	
C201	ECEA1EK470	47	S
C202	ECUV1H103KBV	0.01	
C203	ECUV1H103KBV	0.01	
C204	ECUV1H103KBV	0.01	
C205	ECEA1CKS100	10	S
C206	ECUV1C104KBV	0.1	
C207	ECUV1C104KBV	0.1	
C208	ECUV1H471JCV	470P	
C209	ECUV1H472KBV	0.0047	
C211	ECUV1H471JCV	470P	
C212	ECUV1H223KBV	0.022	S
C213	ECEA1CK101	100	S
C215	ECUV1H560JCV	56P	
C220	ECUV1C104KBV	0.1	
C226	ECUV1C104KBV	0.1	
C227	ECUV1H103KBV	0.01	
C228	ECUV1H103KBV	0.01	
C229	ECUV1H103KBV	0.01	
C231	ECEA1EK470	47	S
C232	ECUV1H103KBV	0.01	
C233	ECUV1H103KBV	0.01	
C235	ECUV1C104KBV	0.1	
C240	PQCUV1H102J	0.001	S

14.4. OPERATION BOARD PARTS

Ref. No.	Part No.	Part Name & Description	Remarks
PCB3	PFLP1196BXZ	OPERATION BOARD ASS´Y (RTL)	
		(IC)	
IC1	PQVIMC4051BF	IC	
		(TRANSISTORS)	
Q1	PQVTDTA143EU	TRANSISTOR(SI)	
Q2	PQVTDTA143EU	TRANSISTOR(SI)	
Q3	PQVTDTA143EU	TRANSISTOR(SI)	
		(DIODES)	
D1	1SS131	DIODE(SI)	
		(CONNECTORS)	
CN1	PFJS11A13Z	CONNECTOR, 11PIN	
		(LIQUID CRYSTAL DISPLAY)	

Ref. No.	Part No.	Part Name & Description	Remarks
CN3	PFAVM190	LIQUID CRYSTAL DISPLAY	
		(PHOTO ELECTRIC TRANSDUCERS)	
PS1	CNA1006N	PHOTO ELECTRIC TRANSDUCER	
PS2	CNA1006N	PHOTO ELECTRIC TRANSDUCER	
		(RESISTORS)	
J18	ERJ3GEY0R00	0	
J30	ERDS1TJ470	0	
R2	ERJ3GEYJ103	10k	
R3	ERJ3GEYJ103	10k	
R4	ERJ3GEYJ103	10k	
R5	ERJ3GEYJ103	10k	
R7	ERJ3GEYJ103	10k	
R10	ERJ3GEYJ103	10k	
R11	ERJ3GEYJ271	270	
R12	ERJ3GEYJ563	56k	
R13	ERJ3GEYJ103	10k	
R14	ERJ3GEYJ471	470	
R15	ERJ3GEYJ103	10k	
R16	ERJ3GEYJ471	470	
R17	ERJ3GEYJ103	10k	
R18	ERJ3GEYJ471	470	
R19	ERJ3GEYJ103	10k	
R20	ERJ3GEYJ471	470	
R21	ERJ3GEY0R00	0	
R28	ERJ3GEYJ103	10k	
R30	ERJ3GEYJ681	680	
		(CAPACITORS)	
C1	ECUV1H104ZFV	0.1	S
C2	ECEA1AKS221	220	
C6	ECUV1C224ZFV	0.22	
		(SWITCHES)	
SW1	EVQ11Y05B	SPECIAL SWITCH	
SW2	EVQ11Y05B	SPECIAL SWITCH	
SW3	EVQ11Y05B	SPECIAL SWITCH	
SW5	EVQ11Y05B	SPECIAL SWITCH	
SW6	EVQ11Y05B	SPECIAL SWITCH	
SW7	EVQ11Y05B	SPECIAL SWITCH	
SW8	EVQ11Y05B	SPECIAL SWITCH	
SW10	EVQ11Y05B	SPECIAL SWITCH	
SW11	EVQ11Y05B	SPECIAL SWITCH	
SW12	EVQ11Y05B	SPECIAL SWITCH	
SW13	EVQ11Y05B	SPECIAL SWITCH	
SW14	EVQ11Y05B	SPECIAL SWITCH	
SW15	EVQ11Y05B	SPECIAL SWITCH	
SW16	EVQ11Y05B	SPECIAL SWITCH	
SW17	EVQ11Y05B	SPECIAL SWITCH	
SW18	EVQ11Y05B	SPECIAL SWITCH	
SW19	EVQ11Y05B	SPECIAL SWITCH	
SW20	EVQ11Y05B	SPECIAL SWITCH	
SW21	EVQ11Y05B	SPECIAL SWITCH	
SW22	EVQ11Y05B	SPECIAL SWITCH	
SW23	EVQ11Y05B	SPECIAL SWITCH	
SW24	EVQ11Y05B	SPECIAL SWITCH	
SW25	EVQ11Y05B	SPECIAL SWITCH	

Ref. No.	Part No.	Part Name & Description	Remarks
SW26	EVQ11Y05B	SPECIAL SWITCH	
SW27	EVQ11Y05B	SPECIAL SWITCH	
SW28	EVQ11Y05B	SPECIAL SWITCH	
SW29	EVQ11Y05B	SPECIAL SWITCH	
SW30	EVQ11Y05B	SPECIAL SWITCH	

14.5. POWER SUPPLY BOARD PARTS

Ref. No.	Part No.	Part Name & Description	Remarks
PCB5	PFLP1227EZL	POWER SUPPLY BOARD ASS´Y (RTL)	⚠
		(ICS)	
IC101	PFVIFA5317P	IC	
IC201	AN1431T	IC	
IC202	PFVITA7805F	IC	S
		(TRANSISTORS)	
Q101	2SK2651	TRANSISTOR(SI)	⚠
		(DIODES)	
D101	PFVD1N4005	DIODE(SI)	S ⚠
D102	PFVD1N4005	DIODE(SI)	S ⚠
D103	PFVD1N4005	DIODE(SI)	S ⚠
D104	PFVD1N4005	DIODE(SI)	S ⚠
D105	PFVDEG01C	DIODE(SI)	S
D106	MA165	DIODE(SI)	
D107	MA4220	DIODE(SI)	
D108	PQVDERA1802	DIODE(SI)	S
D109	PQVDERA1506	DIODE(SI)	S
D201	PFVDSF5LC20U	DIODE(SI)	S
D202	PFVDD1NL20U	DIODE(SI)	S
		(CONNECTORS)	
CN31	PQJP2D98Z	CONNECTOR, 2PIN	⚠
CN301	PQJP8G30Z	CONNECTOR, 8PIN	⚠
		(COIL)	
L101	PFLES11V0523	COIL	⚠
		(RESISTORS)	
J8	PQ4R10XJ000	0	S
R101	ERDS1J1105	0	
R102	PQ4R10XJ823	82k	S
R103	PQ4R10XJ823	82k	S
R104	ERG2DJ204	200k	S
R105	ERX2SJR22	0.22	
R106	ERG1SJ470	47	
R107	PQ4R10XJ680	68	S
R108	ERDS2FJ150	15	
R109	ERDS2FJ100	10	
R110	ERG2DJ204	200k	S
R121	PQ4R10XJ103	10k	S
R122	PQ4R10XJ391	390	S

Ref. No.	Part No.	Part Name & Description	Remarks
R123	PQ4R10XJ221	220	S
R125	PQ4R10XJ103	10k	S
R126	PQ4R10XJ562	5.6k	S
R127	PQ4R10XJ182	1.8k	S
R128	PQ4R10XJ124	120k	S
R129	PQ4R10XJ124	120k	S
R130	PQ4R10XJ154	150k	S
R131	PQ4R10XJ154	150k	S
R132	PQ4R10XJ154	150k	S
R133	PQ4R10XJ154	150k	S
R205	ERG2SJ681	680	S
R221	PQ4R10XJ222	2.2k	S
R222	PQ4R10XJ222	2.2k	S
R223	PQ4R10XJ101	100	S
R224	PQ4R10XJ273	27k	S
R225	PQ4R10XJ332	3.3k	S
		(PHOTO ELECTRIC TRANSDUCERS)	
PC101	0N3171	PHOTO ELECTRIC TRANSDUCER	⚠
		(CAPASITORS)	
C101	ECQU2A224MG	0.22	⚠
C102	ECQU2A104MV	0.1	⚠
C103	ECKNTS222ME	0.0022	⚠
C104	ECKNTS222ME	0.0022	⚠
C105	ECKNTS222ME	0.0022	⚠
C106	PFCEA400SX56	56	S
C107	ECKD3A470KBP	47P	
C108	ECKD3A102KBP	0.001	
C109	ECA1VHG470	47P	
C121	ECUV1H472KBN	0.0047	
C122	ECUV1C224KBX	0.22	
C123	PQCUV1H681JC	680P	S
C124	ECUV1H104KBW	0.1	S
C201	EEUFA1V471	470	
C202	ECKD3A102KBP	0.001	
C203	PFCEA16A1000	1000	S
C204	PFCEA35A47M	47	S
C205	PFCEA50A1M	1	S
		(FUSE)	
F101	PFBAHU215315	FUSE	S ⚠
		(COMPONENTS PARTS)	
L103	EXCELDR35	COMPONENTS PARTS	
		(VARIABLE RESISTOR)	
VR201	EVNDJAA03B53	VARIABLE RESISTOR	
		(VARISTOR)	
ZNR101	ERZV10DK751U	VARISTOR	⚠

Ref. No.	Part No.	Part Name & Description	Remarks
		(OTHERS)	
T101	ETS29AK428AC	TRANSFORMER	⚠
TH101	PFRRT09L8R2F	THERMISTOR	S

14.6. FIXTURES AND TOOLS

Ref. No.	Part No.	Part Name & Description	Remarks
EC1	PQZZ8K18Z	CONNECTOR, 8P	
EC2	PFZZ13K1Z	CONNECTOR, 13P	
EC3	PFZZ5K13Z	CONNECTOR, 5P	
EC4	PFZZ11K13Z	CONNECTOR, 11P	
EC5	PQZZ2K1Z	CONNECTOR, 2P	
EC6	PFZZ6K1Z	CONNECTOR, 6P	
EC7	PFZZ11K14Z	CONNECTOR, 11P	
EC8	PFZZ2K2Z	CONNECTOR, 2P	
EC9	PQZZ2K1Z	CONNECTOR, 2P	
EC10	PFZZ2K2Z	CONNECTOR, 2P	
	KM79811245C0	BASIC FACSIMILE TECHNIQUE	
		(for training service technicians)	

Notes:

Tools and Extension Cords are useful for servicing.
(They make servicing easy.)